GAPS IN HEALTH PROMOTION IN BANGLADESH TO ADDRESS NCDs IN DIFFERENT STAGES OF LIFE

Md. Akhter Imam
Bangladesh

52nd International Course in Health Development/Master of Public Health (ICHD/MPH)

September 21, 2015 – September 9, 2016

KIT (ROYAL TROPICAL INSTITUTE)
Vrije Universiteit Amsterdam
Amsterdam, The Netherlands

GAPS IN HEALTH PROMOTION IN DIFFERENT STAGES OF LIFE IN BANGLADESH

A thesis submitted in partial fulfillment of the requirement for the degree of Master of Public Health

By:

Md. Akhter Imam
Bangladesh

Declaration:

Where other people's work has been used (either from a printed source, internet or any other source) this has been carefully acknowledged and referenced in accordance with departmental requirements. The thesis titled "GAPS IN HEALTH PROMOTION IN DIFFERENT STAHES OF LIFE IN BANGLADESH" is my own work.

Signature:

52nd International Course in Health Development (ICHD/MPH)
September 22, 2015 – September 9, 2016
KIT (Royal Tropical Institute)/ Vrije Universiteit Amsterdam
Amsterdam, The Netherlands
September 2015

Organized by:

KIT (Royal Tropical Institute) Health Unit
Amsterdam, The Netherlands
In co-operation with:
Vrije Universiteit Amsterdam/ Free University of Amsterdam (VU)
Amsterdam, The Netherlands

TABLE OF CONTENTS

Table of Contents

TABLE OF CONTENTS ... 1
LIST OF FIGURES: ... 4
LIST OF TABLES: ... 6
ACKNOWLEDGEMENT ... 7
LIST OF ABBREVIATIONS ... 8
GLOSSARY ... 10
ABSTRACT ... 11
Introduction: ... 12
Chapter One: Background information of Bangladesh: ... 14
1.1 Geography and Demography ... 14
1.1.2 Socio-cultural setting ... 15
1.1.3 Economy: ... 15
1.1.4 Education and gender ... 15
1.1.5 Socio-political system: ... 16
1.1.6 Health System and financing: ... 16
1.1.7. Health Situation: ... 19
1.1.8. Primary Health Care level: ... 20
Chapter Two: Problem Statement, Objectives and Methodology: ... 21
2.1 Problem statement: ... 21
2.2 Justification: ... 23
2.3 Objectives: ... 24
2.3.1 General Objective: ... 24
2.3.2 Specific objectives: ... 24
2.4 Methodology: ... 24
2.4.1. Search strategy and data: ... 24
2.4.2. Conceptual Framework: ... 25
2.4.3 Limitation of the study: ... 26
2.4.4 Exclusion and Inclusion criteria: ... 26

Chapter Three: Potential factors and approaches for NCDs in Bangladesh using PEN public health solution intervention framework. 30
3.1. Infant level: 30
3.1.1: Breastfeeding: 30
3.1.2. Nutrition and complementary food: 32
3.2. Childhood and Adolescent level: 35
3.2.1 Improve life skills education: 36
3.2.2 Promote physical activity in school and society: 37
3.2.3 Safe and healthy foods in schools and marketing restriction for foods with high salt and sugar: 38
3.2.4 Institute tobacco and alcohol controls: 41
3.3. Adulthood: 42
3.3.1. Improve maternal nutrition: 42
3.3.2 Implement tobacco prevention and cessation programs: 44
3.3.3. Improve availability and affordability of food: 46
3.3.4. Encourage physical activity (worksites, urban design): 48
3.3.5. Provide access to effective prevention and care of risks and disease: 50
Chapter 4: Evidence based interventions to improve the NCDs in different stage of life: 52
4.1 Infancy: 53
4.1.1 Breastfeeding: 53
4.1.2. Complementary Feeding: 54
4.2 Adolescent and childhood: 54
4.2.1 LST in school: 54
4.2.2 Physical Activity: 55
4.2.3 Unhealthy food and restriction of marketing and introduction of mid day meal: 55
4.3 Adulthood: 56
4.3.1 Addressing iron deficiency anaemia to improve maternal nutrition: 56
4.3.2 Addressing rural women to reduce smokeless tobacco: 56
4.3.3 Providing care for existing condition: 57
Chapter 5: Discussion, conclusion, recommendation: 62
5.1. Discussion 62
5.1.1. Infancy: 62

5.2.1. Childhood and adolescent: 63
5.3.1. Adulthood: 65
5.2 Conclusion: 67
5.3 Recommendation: 68
References: 72

LIST OF FIGURES:

Figure 1: Map of Bangladesh Source: worldatlas.com.(10) 14
Figure 2: Population Structure of Bangladesh in 2000- 2025(11) 15
Figure 3: Bangladesh Health Service delivery system. Source: Asia Pacific Observatory on Health Systems and Policies(12) 17
Figure 4: A-Density of health-care providers/10,000 populations, B- Health workforces and distribution.(12)(17) 18
Figure 5: THE by Financing Schemes.(18) Source: BNHA-IV 18
Figure 6: Proportion of Mortality due to Major NCDs, Source: Non communicable disease country profile: WHO-2014(21) 21
Figure 7: Pattern of DALY's and NCD related DALY's(11) 22
Figure 8: A shows IYCF indicators and B shows trends in EBF(16)............ 31
Figure 9: Trends in nutritional status of children under age 5, 2000-2014. Source: BDHS-2014(16) Fig A below shows the trend of CF and Fig B shows the association of CF and malnutrition. (16).. 32
Figure 10: A shows trend of CF and B prevalence of stunting, wasting and underweight under two years. (16)(37) 33
Figure 11: A shows trend of CF and B prevalence of stunting, wasting and underweight under two years. (16)(37) 34
Figure 12: Reduction in adolescent substance use following LST participation.(57) 36
Figure 13: A-Types of television advertisement, B-children response in Bangladesh 39
Figure 14: Food pyramid for Bangladesh.(83) 40
Figure 15: Percentage of undernutrition, B- BMI status among ever married women 15-49 years. Page 171-172.(16) 43
Figure 16: Prevalence of current tobacco use in Bangladesh 44
Figure 17: Prevalence of Smoking in Bangladesh in urban and rural areas.(23) 45
Figure 18: Exposure of SHS at home, workplace and public place.(110) 46
Figure 19: Prevalence of inadequate intake of fruit and/or vegetables (< 5 servings/ day) in rural and urban area(23) 47
Figure 20: Present physical activity level in Bangladesh.(23).................... 48
Figure 21: Physical activity Pyramid, Source: Book- dietary guideline,(83) 49
Figure 22: Awareness of the people aged 35 and over and receiving regular treatment.(130) 50

Figure 23: A represents the prevalence of hypertension and diabetes, B represents current and projected people living with hypertension and diabetes(37) 51

LIST OF TABLES:

Table 1: Trends of THE in Bangladesh, by BNHA and WHO.(12)................ 19
Table 2: Search Table 27
Table 3: Smoking initiation by age in Bangladesh. (61) 37
Table 4: Summarized Study Findings/Gaps:... 52
Table 5: Evidence based intervention to address NCDs in different stages of life.. 58

ACKNOWLEDGEMENT

My sincere gratitude goes to the Netherlands Government for financing my studies at KIT through the Nuffic scholarship. I also thank my employers for having nominated me for the scholarship.

I also thank KIT and all staff and teachers of the ICHD course for enrolling me in their noble institution, inspiring me and adding value to my life.

My many thanks go to my thesis advisor and back stopper who tremendously gave me the needed support and guidance throughout my thesis work. They really made my thesis a success and I learnt a lot from them. Thanks to all my classmates of the 52nd ICHD/MPH batch, for their support in diverse ways. They have been a platform I learnt a lot from.

My thanks also go to my family members specially my Mother who has sacrificed one year of not being with me. I am also thankful to my friends for supporting and inspiring me.

My overall thanks go to God almighty, for bringing this blessing on me.

LIST OF ABBREVIATIONS

BCC	: Behavior Change Communication
BIRDEM	: Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders
BBS	: Bangladesh breastfeeding Society
BINP	: Bangladesh Integrated Nutrition program
BDHS	: Bangladesh Demographic Health Survey
BNHA	: Bangladesh National Health Accounts
CF	: Complementary Feeding
CHCP	: Community health care providers
CVD	: Cardio Vascular disease
COPD	: Chronic obstructive Pulmonary Disease
CD	: Communicable disease
DALY's	: Disability adjusted Life years
FP	: Family Planning
FTCT	: Framework convention for Tobacco Control
GATS	: Global Adult Tobacco Survey
GDP	: Gross Domestic Product
GDM	: Diabetes Mellitus
GNI	: Gross National Income
HNPSP	: Health Nutrition and Population Sector Program
IYCF	: Infant and young child Feeding
LB	: Live Birth
LMIC	: Low and Middle Income Countries
LBW	: Low Birth Weight
LST	: Life skill Training
MDG	: Millennium Development Goal
MoE	: Ministry of Education
MoF	: Ministry of Finance
MoH	: Ministry of Health
MoLGRDC	:Ministry of local government Rural development and Cooperatives
MoPA	: Ministry of Public Administration
MoYS	: Ministry of Youth and Sports
MPOWER	: Monitoring, Protecting, Offering, Warning, Enforcing, Raising
NCD	: Non communicable disease
NNP	: National Nutrition program
NGO	: Non-Governmental Organization

OOPP	: Out of Pocket Payment
PHC	: Primary Health care
PEN	: Packages of Essential Non communicable Disease
SDG	: Sustainable Development Goal
SFP	: School Feeding Program
STI	: Sexually transmitted Disease
THE	: Total Health Expenditure
UN	: United Nations
USD	: United States Dollar
UNDP	: United Nations Population Division
UNFPA	: United Nations Population Fund
UNICEF	: United Nations Children's Fund
VU	: Vrije Universiteit
WHO	: World Health Organization

GLOSSARY

Health: WHO defines 'Health' as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

Non communicable disease: Non communicable diseases (NCDs) also known as chronic diseases those do not pass from person to person. They are generally slow progressive and of long duration. (WHO)

Health promotion: According to WHO, Health promotion is the process of enabling people to increase control over, and to improve, their health. It moves beyond a focus on individual behaviour towards a wide range of social and environmental interventions.

Exclusive Breastfeeding: According to WHO, Exclusive breastfeeding (EBF) means that the infant receives only breast milk. No other liquids or solids are given – not even water – with the exception of oral rehydration solution, or drops/syrups of vitamins, minerals or medicines.

Complementary feeding: Complementary feeding is defined as the process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breast milk. The transition from exclusive breastfeeding to family foods referred to as complementary feeding typically covers the period from 6-24 months of age, even though breastfeeding may continue to two years of age and beyond.

Physical activity: According to WHO, Health is defined Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure. Physical inactivity has been identified as the fourth leading risk factor for global mortality causing an estimated 3.2 million deaths globally.

ABSTRACT

Background: Due to its high population and wide range of prevailing risk factors, Bangladesh needs to realize the importance of health promotion to tackle the epidemic threat of NCD that account for 59% of the total mortality.(1) A multisectoral life course approach is yet to be taken for health promotion addressing the risk factors to halt the progression of NCDs.

Objective of study: To explore the gaps in current policies and program responses to address the NCDs in order to develop recommendation to improve the promotional activities for prevention of NCDs.

Methodology: The study carried out on literature review using peer reviewed, published and unpublished articles, thesis, reports, documents, policy brief papers. The study adapted and modified the framework for finding the gaps in policies and program responses in different stages of life.

Findings: Major findings were lack of addressing the working breastfeeding women in policy with low use of local food as complementary feeding, lack of awareness and suitable environment for physical activities, unhealthy food and tobacco use with SHS were found.

Conclusion: Current policies and programs need to realize the changing dimensions those influence the NCDs in Bangladesh. Considering the high range of prevailing risk factors, multisectoral life course approach is needed to halt the progression of NCDs.

Recommendations: Review the policies to reflect on breastfeeding mothers, expand awareness and access to physical activity and sensitize people regarding harmful use of tobacco and unhealthy food consumption.

Key words: Health promotion, NCDs, risk factors, prevention, multisectoral approach, environment Bangladesh.

Word count: 12,572

Introduction:

Of late, not a single day goes by without being highlighted and pointed out some of the public health problems of our time such as, obesity and diabetes, accelerating the death tolls from heart disease, stroke, and cancer, poor nutritional habits, inadequate sanitation, inadequate physical activity, even the astronomical expense of health care and so many more. In a country with 161(2) million people like Bangladesh, implications of an aging population on health care costs and the burden of diseases, and the compelling disturbing scale of the disparities in health status among different strata of our population has become really a burning question.
The rapidly increasing burden of NCD constitutes a major public health challenge undermining the social and economic development throughout much of the developing countries. NCDs accounted for 63% or 36 million of the estimated 56 million deaths that occurred globally in 2008(3) and nearly 80% of the NCD death that is 29 million occurred in Low & Middle Income Countries.(4) The majority of these deaths (36million) were attributed from cardiovascular diseases (48%), cancer 21%, chronic respiratory disease 12% and diabetes 3%.(5) Bangladesh has also been experiencing the NCD burden with its epidemiological transition. According to the World Health Organization's (WHO), in South-East Asia Region, NCDs are responsible for half of annual mortality (54%).(6) Fighting successfully against the maternal mortality, child death, improving nutrition status and improved health services, life expectancy has reached to 71 years for male and 73 years for female.(7) Thus in coming days, the aging population (above 60 years) which is projected to increase from 6.5 million in 2000 to 40.5 million in 2050, will increase the likelihood of experiencing the multiple chronic conditions. In Bangladesh, at present NCDs share the 59% of overall disease burden. Cardio vascular disease has become the top ten causes of death while diabetes is projected to be 4 million in 2025, in addition, 16% of the total death were due to tobacco related illness.(8) However, evidence suggests that successful health promotion activities can prevent much disabilities, delay morbidities and substantial improvement of quality of life(9).

When overall public health status of a society is at risk, every member of that society is affected. This also affects the global health directly or indirectly. Being a government health care professional, I have had the

opportunity to experience the sheer condition prevailing right now. The understanding always inspired me to be inquisitive and to look deeper into the problems where the roots of all the problems lie. The experience I had in my work made me realize from the poorer point of view into a dimension where a preventive approach is much necessary but not adequately present. Therefore, I realised a comprehensive action for efficient outcome of the existing problems must be formulated after elaborate contemplation of the issues concerned.

The aim of the study is to describe the potential gaps existing in current policies and program responses for the prevention of NCDs in Bangladesh. However, this study also intends to produce some messages to people and policy makers, such as, NCDs prevention is antagonist of impoverishment, risk factors are mutually reinforcing and outcome of preventive measures also mutually re-influencing, multilevel cooperation at the population level is the key to address the root of much disabilities that can significantly reduce the burden at the same time improving human development.

The outcome of this research will contribute the currently existing gaps needed to be addressed in Bangladesh for the promotion of preventive measures targeting NCDs. It will also benefit relevant policy makers and stakeholders in ensuring effective measures as well as health professionals and volunteers working in different sectors.

CHAPTER-ONE

Chapter One: Background information of Bangladesh:

1.1 Geography and Demography

The People's Republic of Bangladesh is a North Eastern South Asian developing country which is bordered on the west, north, and east with India and in south by Myanmar and Bay of Bengal. It is a low lying delta plain riverine country except southern hilly part with frequent event of natural disasters. The country has a total land area of 148,460(2) square kilometers. The map of Bangladesh is depicted in Figure- 1.

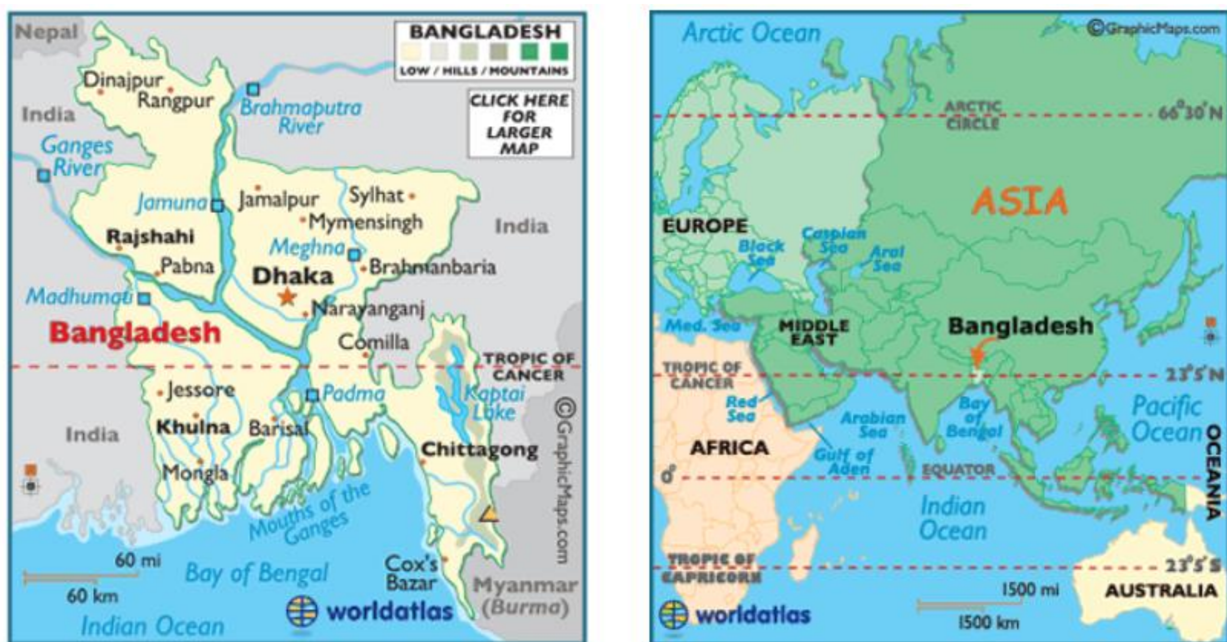


Figure 1: Map of Bangladesh Source: worldatlas.com**.**(10)

The country is a tropical lowland country with annual average temperature of 26°C. Bangladesh has a population of about 161 million with a population density of 1236/ sq. km. (Females 50.5% and Male 49.5% according to 2013 estimates), a growth rate of 1,2%, and an urban population growth is 3.4%.(2) The population structure of Bangladesh is as indicated in figure 2.

No table of figures entries found.No table of figures entries found.

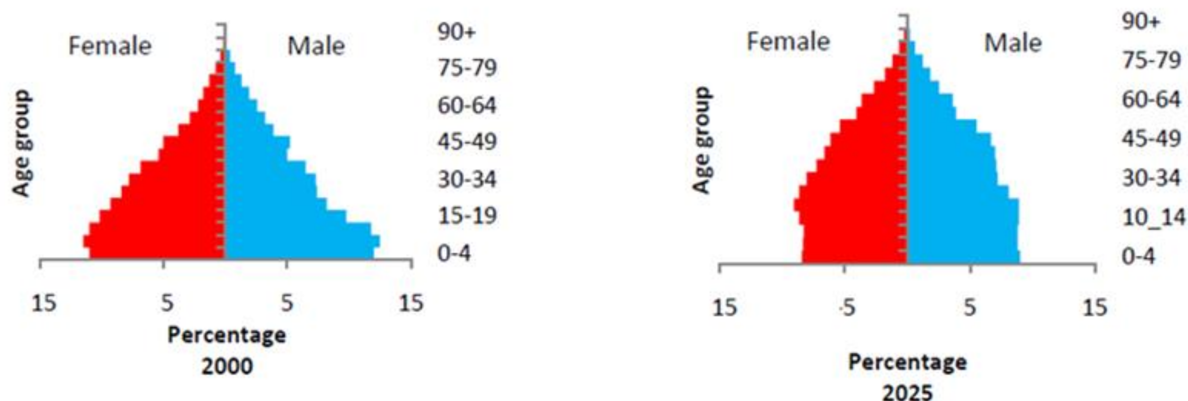


Figure 2: Population Structure of Bangladesh in 2000- 2025(11)

1.1.2 Socio-cultural setting

Bangladesh is a moderate secular predominantly Muslim country with 90% of the total population is Muslims, 9% are Hindus and 1% is Christians, Buddhists and other faiths with different ethnic beliefs(12)(13). The national language of Bangladesh is Bangla, which is spoken and understood by all. Bangladesh positioned at 142 out of 188 countries in terms of Human development index.(14)

1.1.3 Economy:

Bangladesh is still predominantly agricultural country. Bangladesh has a GNI per capita is (PPP) of $3550(2) and a GDP per capita of $1087, 2014(15)with a GDP growth rate is expected to cross 7% in the fiscal year of 2016.(2) Unemployment of labor force is currently at 4.5% (15) and inflation rate is 5.9%(2). 65% percent of men and 24 percent of women age 8 and over are currently working.(16) Besides agriculture, majority of GDP contribution comes from remittance and garments industry where a large number of women are working.(12) Bangladesh has just entered into the LMIC list but still 31.5%% people live under poverty line.(12)

1.1.4 Education and gender

The adult literacy rate in Bangladesh has increased from 29.2% in 1981 to 57.7% till 2011(12). Adult female literacy also increased considerably in the past two decades, from about 26% in 1991 to around 53% in 2011 (World

Bank, 2013). However, 23% of men and 27%of women age 6 and over have not attended school(16).The proportion of children age 6-15 who are attending school has increased from 84% in 2011 to 87% in 2014.(16) In primary and secondary school enrollment, there is almost no gender difference.(16)

1.1.5 Socio-political system:

Bangladesh is a unitary state and parliamentary democracy where an election for a parliament is held in every five years with head of the government is Prime Minister but head of the state is president.(12) The country has a functional parliamentary system and an independent judiciary. Administratively, Bangladesh is divided into seven divisions, 64 districts, 545 upazilas/thanas and Dhaka being the capital of the country.(16) However, despite some political unrest, Bangladesh has achieved remarkable progress in health and economic development.(12)

1.1.6 Health System and financing:

In Bangladesh, the Ministry of Health (MoH) is primarily responsible for making policies and implementing programs, from clinical to public health service. The health system is mainly centralize and is controlled by the MOH by its two wings, namely, Directorate General of Health Services (DGHS) and Family Planning (FP) wing.(12) Healthcare in Bangladesh is pluralistic in natures and involves four key actors namely public, private, NGOs and donors.(13)In addition, the delivery of health services in urban areas, including primary health care services, is mandated to the Ministry of Local Government, Rural Development and Cooperatives (MOLGRDC).(13)

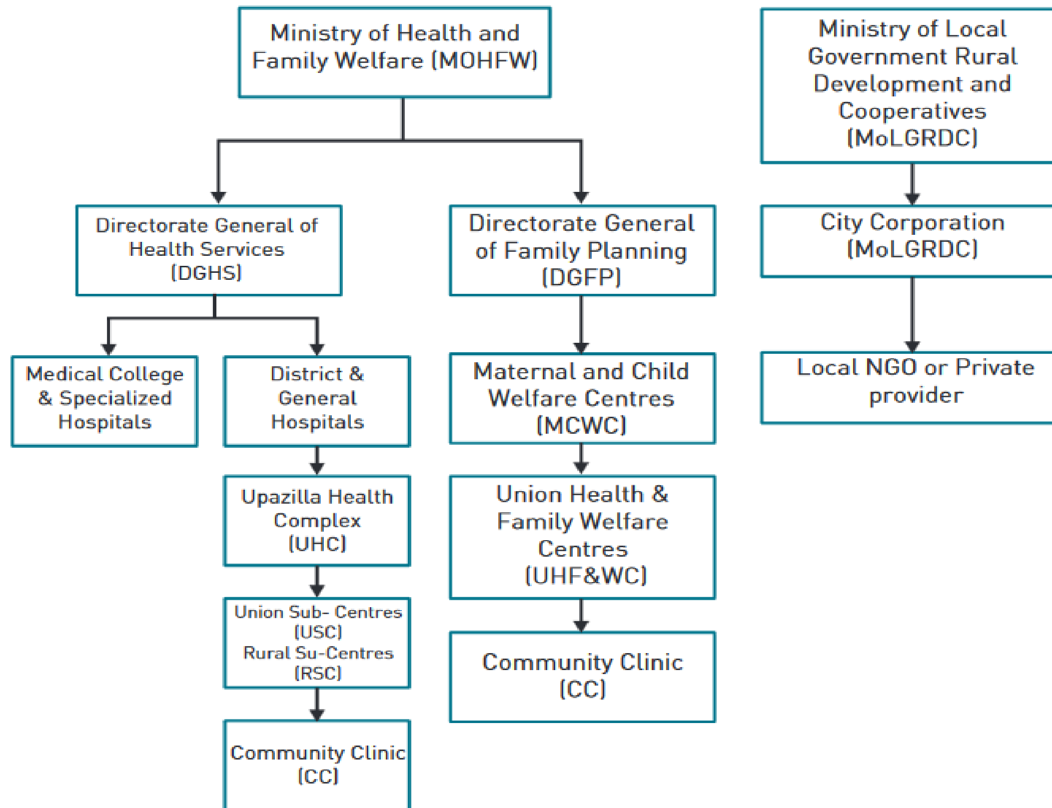
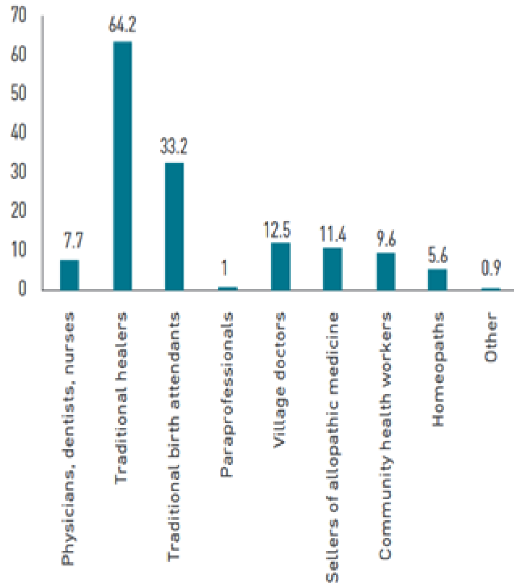


Figure 3: Bangladesh Health Service delivery system. Source: Asia Pacific Observatory on Health Systems and Policies(12)

Healthcare access and services in the country are inadequate with urban centers having more access to healthcare facilities, but extensive health coverage in rural areas with community clinics and satellite clinics where ante natal care, vitamin supplementation are almost available.(12) However, with a qualified health workforce population density is 7.7 per 10000 population is a major challenge.(17)



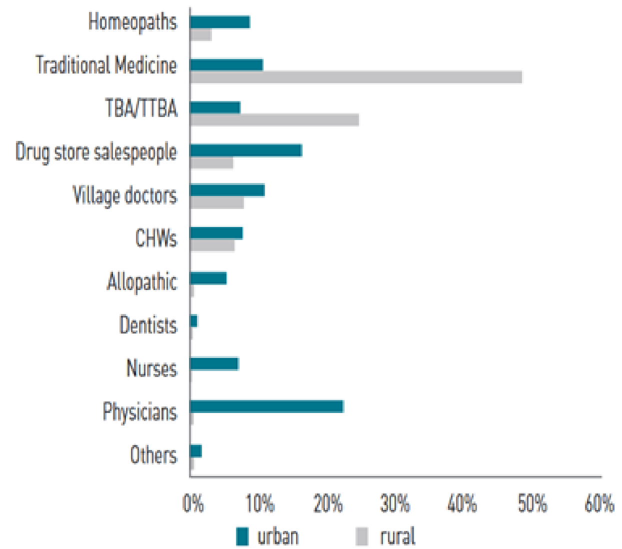


Figure 4: A-Density of health-care providers/10,000 populations, B- Health workforces and distribution.(12)(17)

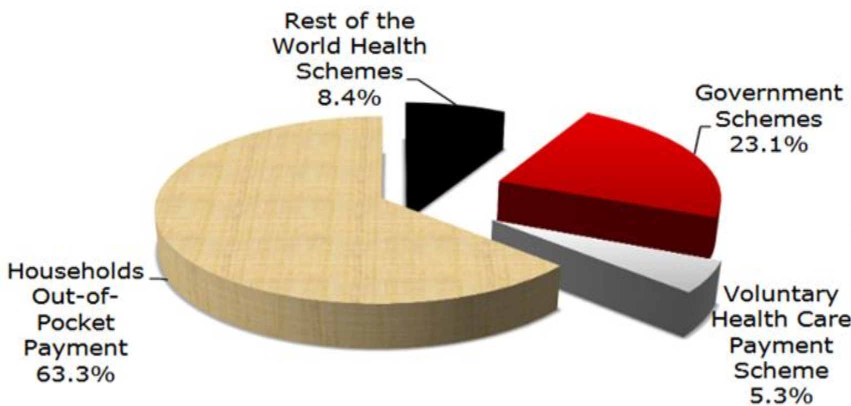


Figure 5: THE by Financing Schemes.(18) Source: BNHA-IV

Healthcare in Bangladesh is financed mainly by government budgetary allocations along with some international donors. However, total health expenditure comes from OOPP while very limited insurance or other prepayment schemes are available. The high levels of OOP almost 64% (Figure-5&Table-1) combined with informal payments are causing catastrophic household expenditure and thus financial risk protection remains a major challenge.(18) Despite having an extensive health infrastructure, but it is not well equipped with financing, workforce, prioritizing targets and drugs and with technologies.(12)

Table 1: Trends of THE in Bangladesh, by BNHA and WHO.(12)

Trends in health expenditure in Bangladesh, 1997–2011

	National reports					WHO estimates			
	1997	2000	2003	2005	2007	2008	2009	2010	2011
Total Health Expenditure in US$ per capita	9.2	10.1	115	13.7	16.2	19.4	22.4	24.8	26.5
Total Health Expenditure as % of GDP	2.7%	2.8%	3.0%	3.2%	3.4%	3.5%	3.7%	3.7%	3.7%
Public expenditure on health as % of THE	36%	31%	28%	26%	26%	36%	37%	37%	37%
Public expenditure on health as % of GDP	1%	1%	1%	1%	1%	1%	1%	1%	1%
OOP as % of total health expenditure	57%	59%	61%	64%	64%	62%	61%	61%	61%
NGO expenditure as % of THE	1%	2%	2%	2%	1%	-	-	-	-
External assistance to NGOs as % of THE	5%	7%	9%	8%	8%	-	-	-	-
Other private expenditure as % of THE	1%	1%	1%	1%	1%	-	-	-	-

1.1.7. Health Situation:

Life expectancy at birth is 70.7 years; 69.1 years for males and 71.6 for females(7). BDHS 2011 and 2014 showed a total fertility rate of 2.3 with an average of 2.0 in urban areas and 2.5 in rural areas with 70% giving birth by age 20. Maternal mortality ratio was 176 per 100,000 Live Birth and neonatal mortality rate of 23.3 per 1000 live births in 2015 (16)(WHO). Under 5 mortality rate was 37.6/ 1000 Live Births,(WB) adolescent birth rate is 113 children per 1000 women, contraceptive prevalence is about 62.4% and unmet need for FP is 12%(16) Infant mortality rate was 39/1000Live births and measles vaccination for one year children was 86.9%.(16). Improved sanitation was 60.6% and improved source of drinking water was 86.6 %.(2) NCD has taken place the major share of 61% of all death and 360/10000 population.(12)

1.1.8. Primary Health Care level:

There is an extensive health care coverage by Community clinics (CC) or satellite clinics or union sub centers, one for every 6000 people within 30 minutes walking. One of the major objectives of these CC were to promotion of NCDs.(12) As of 2012, the number of the PHC was 1257, those are staffed with medical assistant, community health care provider(CHCP). (12) As in figure indicate the informal health care providers dominate the health system, they play role in PHC level. However, the core objective was to provide preventive and promotional activirties and some curative services but these PHC has received very low allocation from the health budget.(12)

Chapter Two: Problem Statement, Objectives and Methodology:

2.1 Problem statement:

Bangladesh has made a significant improvement in general health status of the huge population in terms of reducing maternal and child mortality, immunization, family planning, but addressing NCDs is still a major threat than ever before. The epidemiological transition, life style, low physical activity, increased average life expectancy, rapid urbanization generally increase the NCD burden. Health workforce remains as a major challenge as Bangladesh has a population of 161 million (2)and there are approximately seven physicians and two nurses for every 10000 people.(12) More than 25% of the physicians and 22% of the nurses positioned posts were vacant in Upazila health complexes.(19) Bangladesh has a ratio of doctors, nurse and midwives of 1:0.4: 0.24 where WHO recommendation is 1:3:5.(12) In terms of shortage Bangladesh still needs 90000 doctors, 273000 nurses, 455000 midwives(20). The health workers are harshly low in absolute numbers and cruelly underrepresented in the rural areas compared to the urban areas without formal training on NCDs. According to the census, about 59% of the total disease burden was due to NCDs. (1) Bangladesh with its huge population burden has been facing tremendous challenges due to its effect on health as well as productivity and economy. Among all the deaths from major NCDs, CVD accounted for 17%, cancer 10%, chronic respiratory diseases11%, and diabetes accounted for 3%(21)

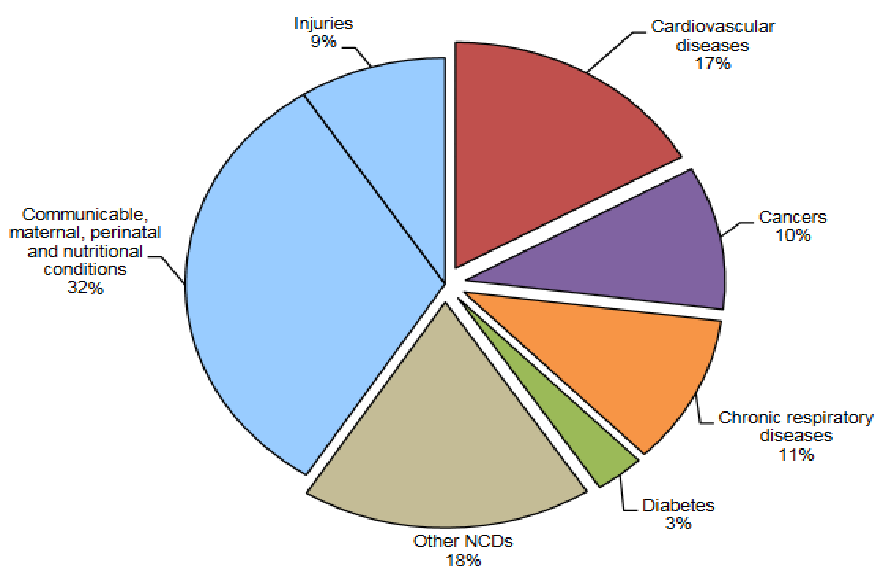


Figure 6: Proportion of Mortality due to Major NCDs, Source: Non communicable disease country profile: WHO-2014(21)

Additionally lack of knowledge about proper nutrition, physical activity, obesity, knowledge and awareness about care of existing condition are also major threats. Increasing trend of risk factor for NCDs over the decades with everyone having at least one risk factor for NCDs clearly indicates the unforeseen threat for Bangladesh. (22).

High rates of tobacco use (rural – 55.5%, urban 46.5%- both sexes)(23), moderate rates of fruit and vegetable consumption among adults (vegetables and fruit is less than 95.7% with < 5 servings/ day)(23), and high rates of physical inactivity particularly women (Urban male 17.2%, female 43.6%, Rural male: 8.8%; women: 39.1%)(23), increasing trend of childhood obesity (6 to 12 years of age is 3.5 % and 9.7%)(24), indicate the future threat for NCD burden. The economic burden due to NCDs is actually astronomical in terms of Bangladesh economic profile. Tobacco alone costs about $ 44 million, the diabetic care can take up 24.5% annual income alone and alarmingly half of the rural people were not poor before having an accident.(25) Figure-7 below shows the pattern of Daly's for NCDs and CDs.

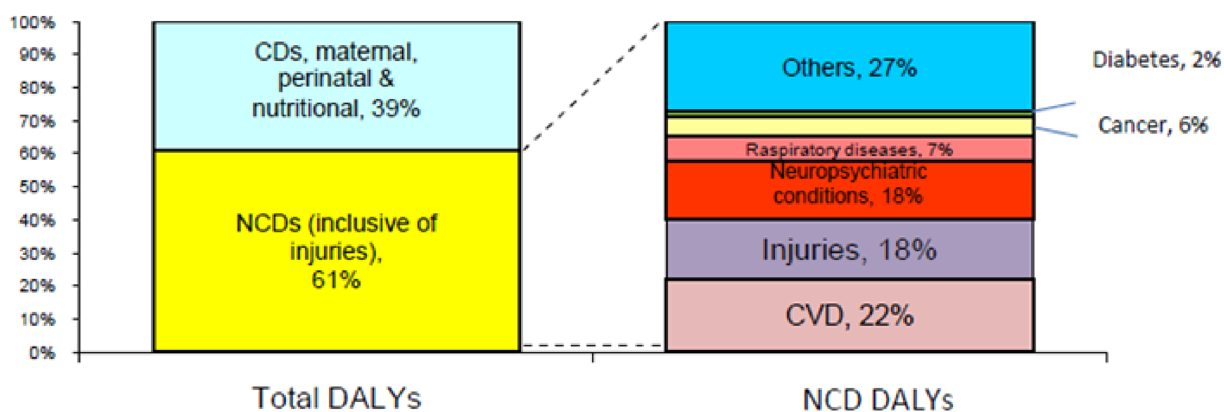


Figure 7: Pattern of DALY's and NCD related DALY's(11)

In coming years, aged people above 60 years will take up almost 18.8% of the total population potentially increasing the NCD burden.(25) Besides an enormous health burden, NCDs have serious socioeconomic implications. They disproportionately affect the poor, leading to loss of household income, poor physical capacity and loss of wages. Due to long-term treatment costs and high out-of-pocket costs, NCDs can result in catastrophic health expenditures and impoverishment. At present all NCDs treatment and care are coming mostly from tertiary hospital that also cause a great financial

burden and act as a barrier to seek treatment for most of the poor.(11) Needless to mention, treatment and prevention of NCDs along with drugs are not included in the basic package in public sector primary care system.(11)

2.2 Justification:

The problem analysis has shown that NCDs affect all socio-economic groups in Bangladesh. Burden of disease due to NCDs, both morbidity and mortality, is steadily growing, that the poor, and those living in rural areas (most people in rural areas are poor) bear this burden disproportionately. This population health problem needs to be addressed; and evidence shows that a context appropriate response is the key to a successful public health response. For example, while there is no doubt that timely detection and treatment of NCDs is important, there is robust evidence to show that for NCDs, the poor are less likely to benefit from early detection and management of NCD, and are more likely to benefit from interventions that are focused on prevention. Similarly, as pointed out in the problem analysis, Bangladesh has a high prevalence of risk factors for NCDs; tobacco use is high (44%), diet is poor, physical inactivity is a countrywide problem (57% rural, 10% urban)(23). All these behavioral risk factors of NCDs can best be tackled through well designed and context appropriate health promotion interventions, and yet NCDs have yet not been prioritized in prevention and control. Addressing the determinants of the major NCDs in Bangladesh remains a neglected area in public health policy and practice. Bangladesh health system still not well predominantly focuses on curative care rather prevention and only 80% percent of health facilities do not have at least one staff member trained for either diabetes or CVD.(13) Evidence shows that if Bangladesh were to prioritize health promotion interventions for NCDs, it could roughly save 36.7 billion dollars by 2030.(26) There is also robust evidence to show that a life stages based approach to health promotion has the best potential for sustainable improvements in tackling the risk factors for NCDs, and that a life stages based framework for health promotion for NCDs offers a robust analytical tool to examine NCDs related policy and program responses.(27)

Given the growing and disproportionate burden of the problem on the poor, and given that promotion and prevention are the most effective approaches to tackle the problem, it is important to critically examine the current health

promotion related policy and program approaches to NCDs in Bangladesh, in order to identify the gaps and areas for improvement. As a life stages based approach to health promotion has the potential for sustainable improvements in tackling the risk factors for NCDs, it may be appropriate that a life stages based framework for health promotion for NCDs be used as an analytical tool to do so.(28) A life course approach was also emphasized in the NCD action plan for South Asian region 2013-2020.(29) This is the purpose of this thesis; the thesis goes on thereafter to review the evidence base on strategies to address the identified gaps, and provides context appropriate recommendations to improve the NCD policy and program responses in Bangladesh.

2.3 Objectives:

2.3.1 General Objective:

To identify the gaps in 'Health Promotion' in different stages of life in addressing NCDs in Bangladesh and to review the evidences in strategies to address these gaps in order to improve the NCD policy and program responses.

2.3.2 Specific objectives:

1. To explore the areas and gaps in health promotion during infancy needed to be addressed to prevent NCDs in later life.
2. To identify the gaps in health promotion during childhood and adolescence to reduce early onset of NCDs.
3. To identify the gaps in health promotion in addressing the risk factors and individual behaviours during adulthood susceptible for NCDs.
4. To review the evidences on approaches to address the identified gaps in order to come up with recommendations for policy and practice in context of Bangladesh.

2.4 Methodology:

2.4.1. Search strategy and data:

This study aims to find the areas for the health promotion to reduce the burdens of the NCD's which are major threats for public health in Bangladesh. The study will be based on literature review.

The literatures will include published and unpublished documents, grey literature from information from conferences and workshops. Google was

used to find various websites including website of WHO, UNICEF, UNFPA, UNICEF, WB, HMIS, DGHS, MOHWF, DHS, BBS (Bangladesh Bureau of Statistics), NIPORT, DGHS, MOPA. Information from reports, books, fact sheets, policy documents, standard guidelines and protocols were retrieved from these institutional websites where needed. The literatures were searched on internet search engine such as Google, Google scholar, pub med, Science alert, VU library which found a lot of articles. These articles were further screened for relevant ones by reading the abstracts according to the study objectives, those did not match were left out. Bibliographies of relevant articles were also used as a mean to search for other articles cited. Search words used to search the articles were according to the specific objectives which are listed in table-2. Search strategy also includes Boolean method in correlating the factors and objectives, i.e. breastfeeding AND NCD or working mother AND breastfeeding.

2.4.2. Conceptual Framework:

The conceptual framework has been adopted from the WHO Package of Essential Non communicable (PEN) Disease Interventions for Primary Health Care in Low Resource Settings. For the study this has further been modified and adopted according to the Public health solutions for prevention and control of NCDs for low resource settings. It focused on the packages of essential NCD interventions (PEN) for strengthening equity and efficiency of primary health care in low resource setting health systems. Thus this intervention framework emphasize to address the NCDs targeted a comprehensive public health approaches towards human life span and has been used as a guideline to address the areas where healthy life can be promoted in each of the components. These activities are described in the following chapters ranging from infancy to adulthood as stated in the modified and adapted framework. The framework is flexible as it allows exploration of intervention areas. It is also straight forward and specifically illustrates how the issues can be targeted in addressing the NCD for primary prevention. The result, findings and the discussion sections will be guided by the specific objectives.

Infancy:

- Exclusive breastfeeding for 6 month
- Nutritionally adequate and safe complementary feeding starting from the age of 6 month with continued breastfeeding up to 2 years of age or beyond.

Childhood and adolescence:

- Improve life skills education;
- Promote physical activity in school and society;
- Safe and healthy foods in schools;
- Restrict marketing of and access to food products high in salt/sugar/unhealthy fats;
- Institute tobacco and alcohol controls.

Adulthood:

- Improve maternal nutrition
- Implement tobacco prevention and cessation programs;
- Improve availability and affordability of food;
- Encourage physical activity (worksites, urban design);
- Provide access to effective prevention and care of risks and diseases.

2.4.3 Limitation of the study:

Since the language for the review is only English, relevant literature in other languages will be left out. However, Bangla was only used to see the National Health policy of Bangladesh as it is written in Bangla. The free peer reviewed articles were used. Moreover, some unpublished articles, documents, thesis work were also used with proper citation. The above limitations were addressed during the analysis by using multiple sources of data with similar contexts to triangulate. Since there was limited nationwide data, multiple studies done across the world were used to present evidence and to triangulate by using similar studies and context. Since there were not enough articles in context of Bangladesh in limiting the tobacco use in rural women; evidences from the developed countries were used.

2.4.4 Exclusion and Inclusion criteria:

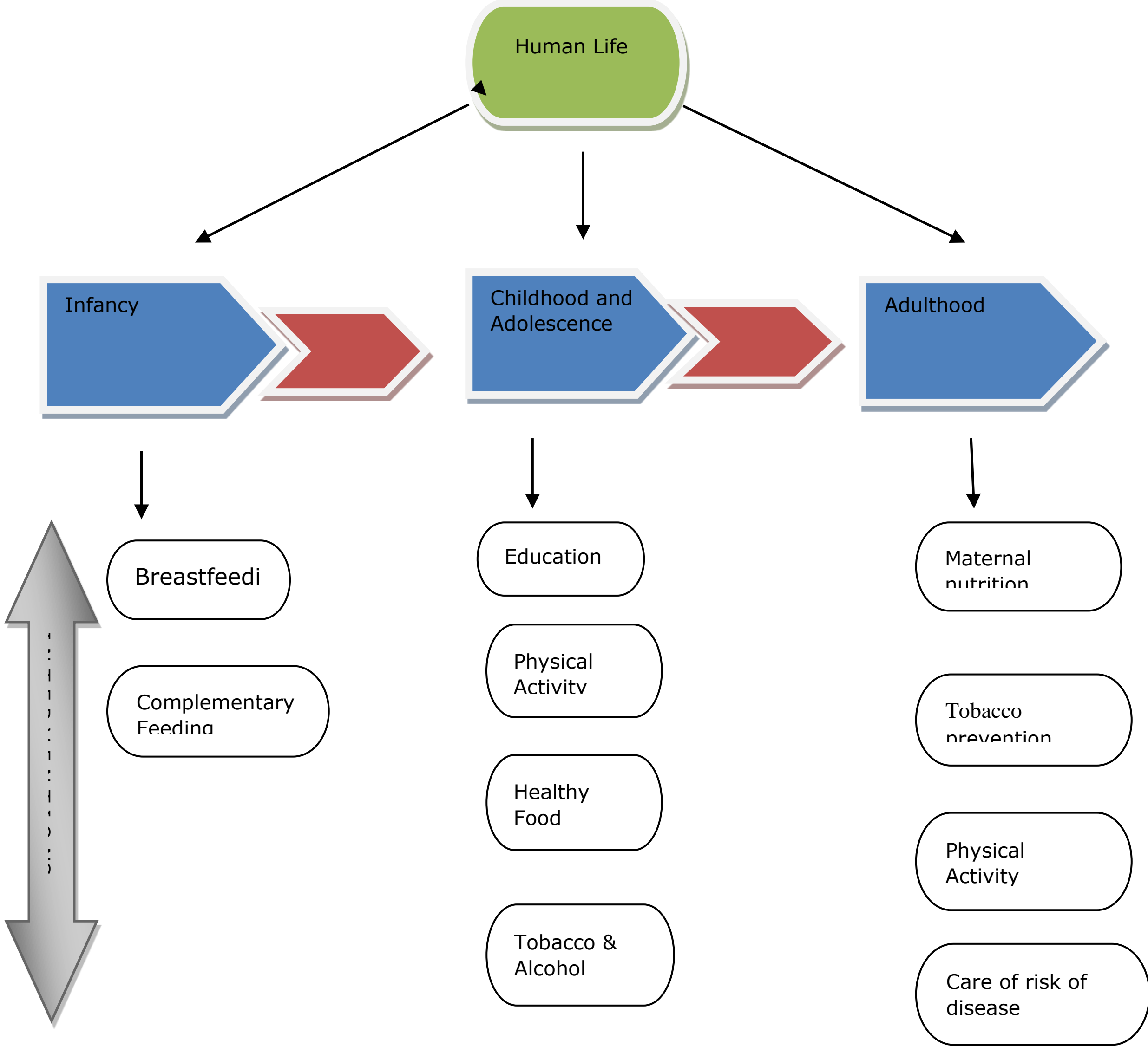
The articles written in English were used. However, Bangla was used only to see the National Health Policy. The literatures were included if they could be applied in the context of NCD promotion. Specific clinical interventions related to NCDs around the world were not included. The articles those did not have free access were also not included. Articles were searched without any year limitation.

Table 2: Search Table

Source	Key words used for specific objectives		
	Specific Objective 1	Specific Objective 2	Specific Objective 3
Pub Med Google, Scholar, VU library	NCD AND Bangladesh, Infancy AND NCDs, breastfeeding, EBF AND NCDs, Infant nutrition, Maternal nutrition And Bangladesh, Maternal leave AND Bangladesh, Working women and maternal workload, Working women in Bangladesh, knowledge and practice of breastfeeding in Bangladesh.	Children and NCD, Adolescents substance use in Bangladesh School education, behaviour, Healthy food in School, Fast food marketing in Bangladesh, child obesity AND Bangladesh, School physical activity, adolescent nutrition, teen age nutrition AND pregnancy, 'Teen age pregnancy AND Bangladesh',	Maternal nutrition AND Bangladesh, nutrition AND NCD, tobacco AND women in Bangladesh, hazards of tobacco, Physical activity AND urbanization, use of modern devise AND physical activity, existing condition
Ministry of Health, Director general and	Health, status, child nutrition, Infant and child mortality, breastfeeding and IYCF practices, programs,	Child nutrition, child mortality, Nutrition program, National Education Policy, National Health Policy	Training, Community based programs AND NCD, Workforce,

health service, (DGHS), Ministry of Education			'Health system AND service delivery in Bangladesh', programs and Training, Tobacco control program. Existing condition, Healthy food, Food security
WHO, WB, UNICEF, UNFPA	Bangladesh, Maternal nutrition program, breastfeeding. IYCF practice guidelines, best practices.	Bangladesh, child and adolescent nutrition, teen age pregnancy AND iron deficiency, physical activity in School, tobacco, risk factors,	Maternal nutrition AND NCD, Physical activity, tobacco, care of existing condition.

Figure 8: Conceptual Framework:



Chapter Three: Potential factors and approaches for NCDs in Bangladesh using PEN public health solution intervention framework.

The purpose of this section is to find gaps in current policy and program responses for health promotion in different stages of life. They are categorized in specific behavioural patterns according to the framework that targets development of individual skill and capacities in continuously changing social, environmental and economic dimension which have impact on health. Since many issues are interrelated and influence each other throughout the life, several gaps have been discussed together, for example, healthy food in school and restriction of unhealthy food can take place at the same time, similarly adolescent nutrition can significantly improve the maternal condition in adulthood, likewise, physical activity can influence in all stages of life.

3.1. Infant level:

3.1.1: Breastfeeding:

Evidence shows that diet and nutrition in early life not only influences growth patterns in children but also have profound effect on developing NCDs in later life.(30). Breastfeeding significantly reduces the risk of obesity, LBW, type1 and type 2 diabetes, protective against elevated blood pressure and closely linked to other NCDs.(30),(31)(32)(33). It is evident that EBF reduces the chance of developing breast cancer, ovarian cancer, respiratory disease and post natal depression in mothers.(30,34,35). The Global Burden of Diseases, injuries, and risk factors study found suboptimal breastfeeding as the second largest risk factor for children under five, accounting for 47.5 million Disability Adjusted Life Years (DALYs) lost in 2010(36). WHO estimated that 1.3 million child deaths could be avoided through the promotion of EBF each year globally and one-fifth child mortality in developing countries through EBF and complementary feeding. (30)(31) The benefit of EBF are thus very significant, but these benefits are not merely restricted to childhood, but continue to play lifelong thereby placing promotion of EBF at the centre of health promotion strategy in 'Infancy'.

Exclusive breastfeeding is widely recommended, but poorly practiced in Bangladesh.(31) The rate of the EBF in 2004 was 42%, in 2007 it was 43%, in 2011 it increased up to 64% but in 2014 it decreased to 55%.(37) (16)

The initiation of breastfeeding is often delayed, with less than one in four infants (24%) were put to the breast within an hour of birth(38). Over one in five (22%) of infants aged under 6 months and 27% of infants aged 6-9 months are bottle-fed(38).

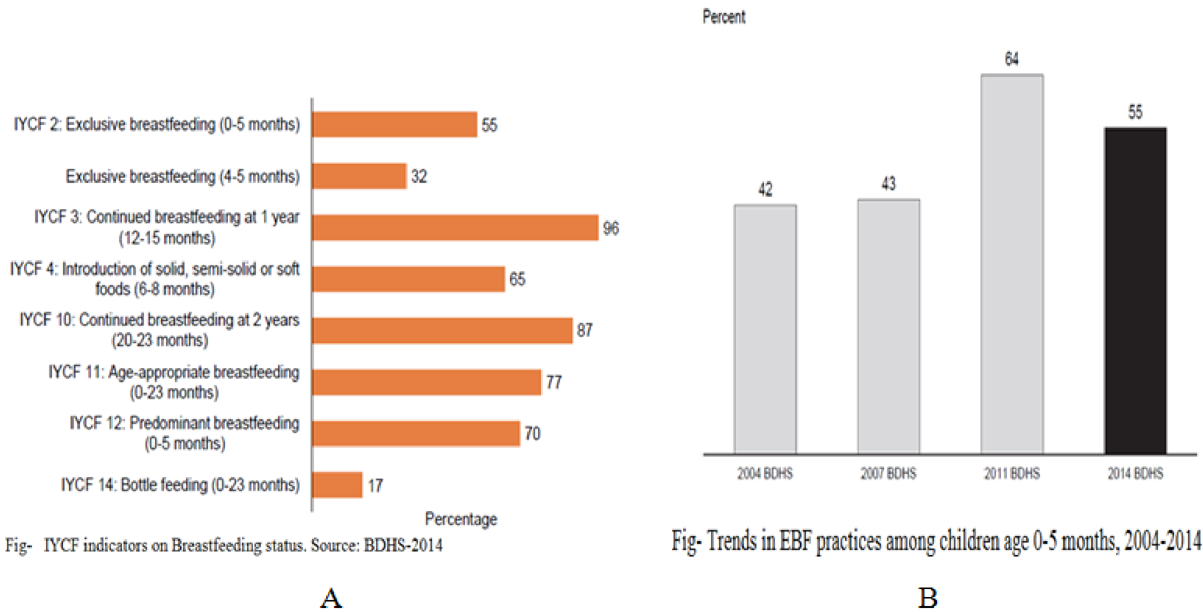


Figure 8: A shows IYCF indicators and B shows trends in EBF(16)

Bangladesh acknowledges the importance of EBF in its NCD strategies plan.(1) The baby friendly hospital initiative has promoted EBF but a large number of women deliver their babies at home and many of them do not initiate colustrum feeding or EBF due to lack of knowledge.(39) In recent years, the women workforce increased more than two folds and was estimated as 36% in 2014 compared to 14% in 1990.(40) and not taking into account those women working in processing of agricultural activities.(16) Though Bangladesh government provide six months paid maternal leave, but many private companies do not follow this rule which is a breach of ILO maternity protection Laws where evidence shows an increase rate of EBF for longer maternal leave.(41)(42) Working women are often forced to leave the job or they have to give the baby with formula feeding or caretaker fed.(43) This has an implication on policy for promotion of EBF particularly addressing the working mother those are increasing very fast that leads towards the supporting work place.

3.1.2. Nutrition and complementary food:

Inappropriate feeding to children is a major cause of malnutrition with underweight, stunting or wasting are common outcome.(44) Besides EBF, infants should be given nutritionally adequate and appropriate complementary foods (CF) along with BF upto 23 months.(16) Timely introduction of CF were shown to be protective against obesity later in life.(35) Deficiencies of micronutrients within 2 years cause illness and stunting which is very difficult to reverse. (45) It has been estimated that nearly 50.6 million under-five children are malnourished worldwide and almost 90% of these children which is two out of five are from developing countries.(31) (45) It is evident that fetal malnutrition causes LBW babies that increase risk of NCDs.(46)(47) Bangladesh is one of the highest number of children with malnutrition where 36%, 14%, and 33% children under five are stunted, wasted and underweight respectively due to malnutrition (Figure-10)(48)

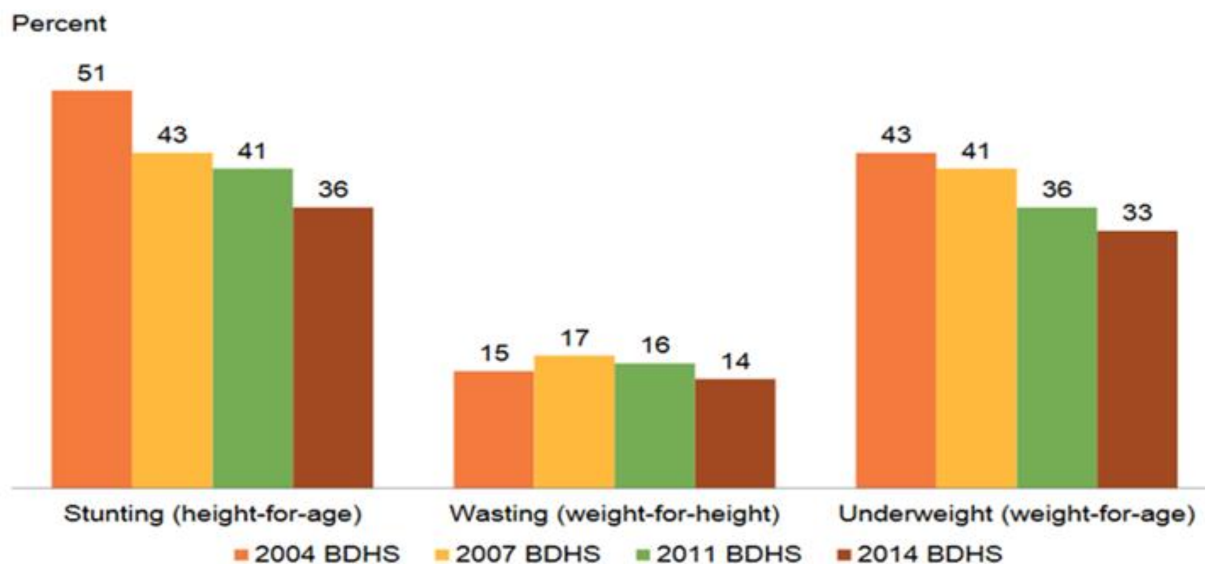


Figure 9: Trends in nutritional status of children under age 5, 2000-2014. Source: BDHS-2014(16) Fig A below shows the trend of CF and Fig B shows the association of CF and malnutrition. (16).

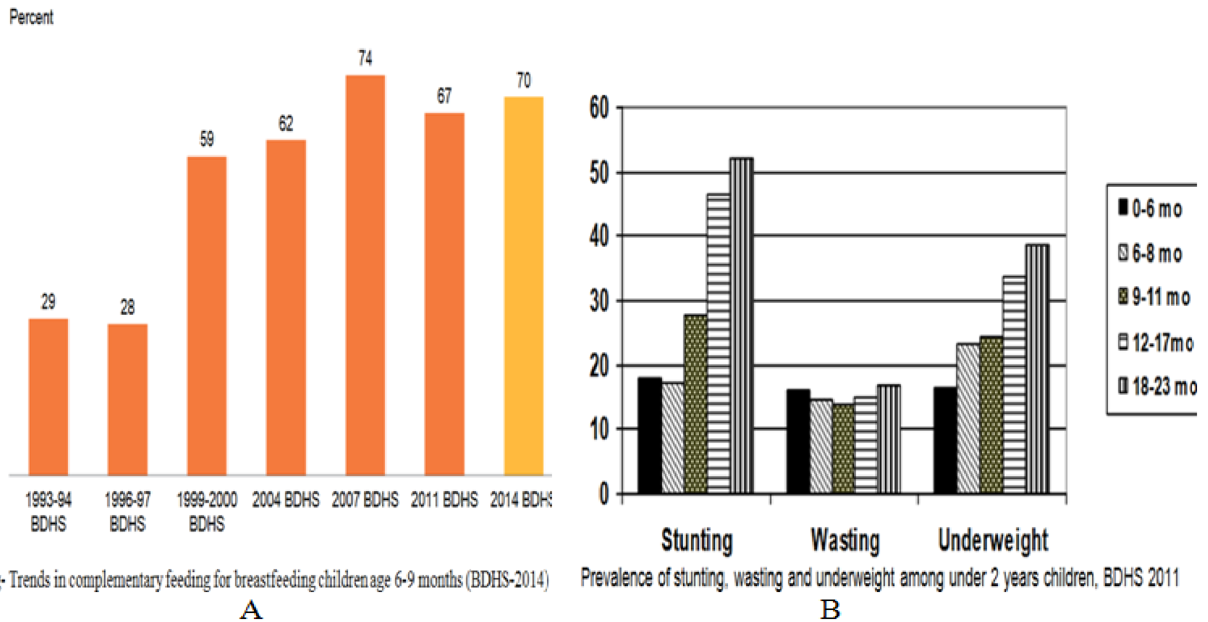


Figure 10: A shows trend of CF and B prevalence of stunting, wasting and underweight under two years. (16)(37)

In Bangladesh, 70% of breastfed children age 6-9 months receives complementary foods but not all receive adequate amount and quality.(16). Only 23% of children age 6-23 months are fed according to recommended IYCF practice and condition is worse in rural areas(16). According to WHO guideline, EBF children should be given 2-3 times CF a day and 3-4 times a day at 9- 23 months of age(49) Study found that 40% of 6-8 months children received CF twice a day and only 33% received the recommended CF(50). Figure A below shows IYCF practices according to minimum standard of acceptable feeding practices and B show children getting dietary diversity, meal frequency, and minimum acceptable diet.

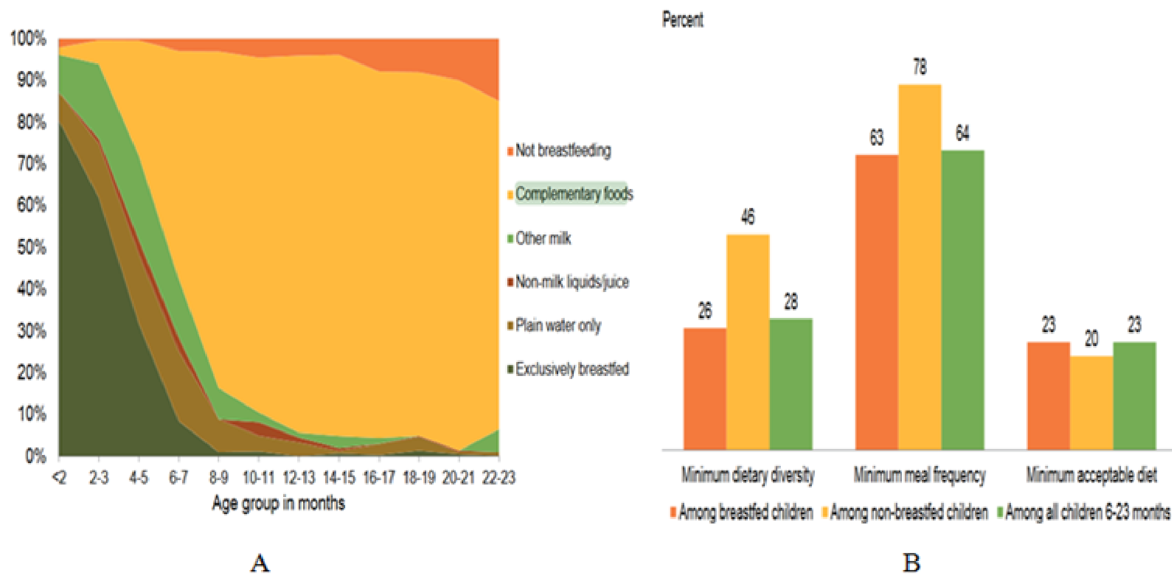


Fig- A-Infant feeding practices by age, Fig-B Percentage fed according to minimum standard of acceptable feeding practices .Source: BDHS-2014.

Figure 11: A shows trend of CF and B prevalence of stunting, wasting and underweight under two years. (16)(37)

One third of the mothers started CF before six month as they had the misconception of early starting of CF is good.(45). Some industries encourage the use of processed CF through media too early that may affect EBF rather appropriate feeding.(51) However, many do not know about the nutrition, food value, hygiene and processing of high nutritious local foods for CF and many mothers feed canned food.(45) Costing for CF was a concern for many parents thus given CF in many cases are devoid of animal source resulting in inadequate nutrition.(52) Only 37% consume Vitamin A rich food, fruits and vegetables, 43% have fish, meat and poultry and only 25% consume egg.(45). Locally available food is rich in protein and other micronutrients with a low cost but not very commonly used for CF.(45). This indicates the need of promotion of using local food as CF to achieve adequate nutrition in a cost effective way for a country like Bangladesh.

3.2. Childhood and Adolescent level:

> *"We have to continually ask ourselves what legacy we wish to leave our children. …We have given them life, let's make sure they can live it to the fullest without the threat of disease robbing them of its quality later on."* — **Her Excellency Reema Carmona** First Lady of the Republic of Trinidad and Tobago, opening the NCD Child conference on March 20, 2014.

Global response to NCDs should be accelerated worldwide during childhood and adolescence as 43% of the world's population are young, rising to 60% in the LMICs.(33) The prevalence of adolescent hypertension is 4.5%, more than 25% obese adolescents have early signs of diabetes, 70% obese adolescents have at least one risk factor for CVD, and approximately one in ten has asthma.(53) In 2002, NCDs killed an estimated 1.2 million children under the age of 20 worldwide with millions to get care.(54) Most recent data suggest that a life course approach to NCDs, which includes children and adolescents, is the most effective way to reduce NCD-related mortality and morbidity.(27)

3.2.1 Improve life skills education:

The life skills are sometimes called as social and emotional learning(55) and are often involve self-perception and awareness, motivation, self control and regulation, some social skill such as empathy, kindness, sharing, cooperation, resilience and coping.(56) Life Skill Training(LST) can significantly reduce the initiation of adolescent smoking, alcohol, marijuana and can effectively reduce the violence and delinquency(57). One study from 17 LMICs school showed that LST targeting individual behaviour can play role in reducing NCDs.(58). It is possible to reduce the adolescent initiation and use of tobacco, marijuana and alcohol use significantly by proper LST(59). Children with more years of schooling and equipped with knowledge, attitudes and skill are regarded to be similar to vaccination against health threats.(55) Evidence shows the life skill education can intervene from health hazard like tobacco, alcohol consumption to mental health and violence.(55)

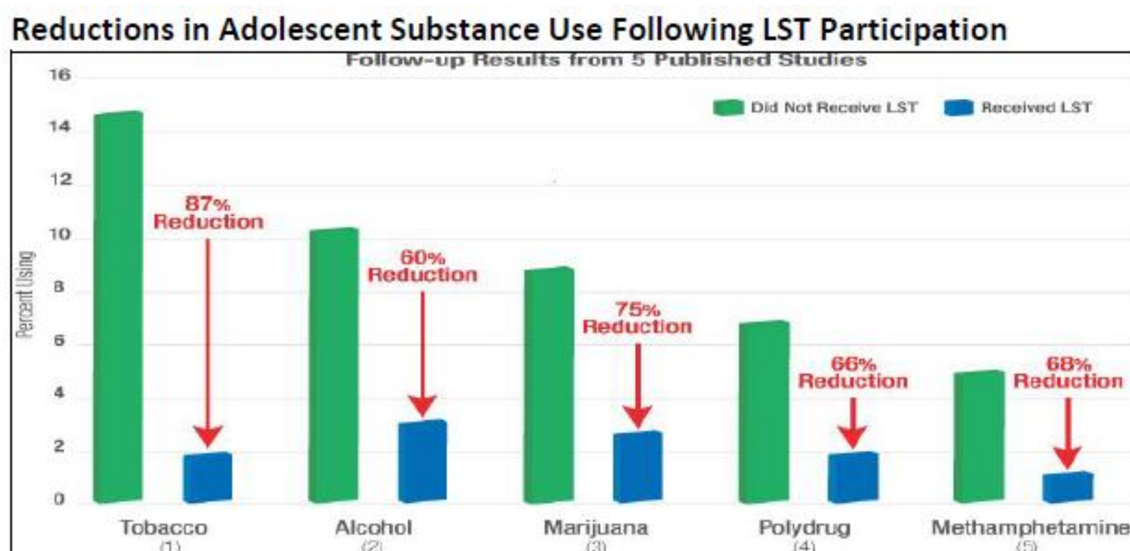


Figure 12: Reduction in adolescent substance use following LST participation.(57)

In Bangladesh, due to globalization and urbanization, adolescents and young children have been facing tremendous challenges in coping up with their normal life. Though alcohol consumption is much lower due to social and religious factor (17) but 43.3% of Bangladeshis aged 15 and over were reported to be tobacco users, among them 39.7%% initiated smoking and 21.4% initiated smokeless tobacco at the age of 15-19 years and smokeless tobacco initiation was (60)(61).(Table-3).

Table 3: Smoking initiation by age in Bangladesh. (61)

	Age of initiation of smoking (In year)						
	5-9	10-14	15-19	20-34	35-49	50+	Total
Male	0.6	12.5	39.7	43.6	3.2	0.5	100
Female	1.1	11.5	28.0	46.5	10.1	2.8	100
Total	**0.6**	**12.4**	**38.7**	**43.9**	**3.7**	**0.7**	**100**

	Age of initiation of smokeless tobacco use (In year)						
	5-9	10-14	15-19	20-34	35-49	50+	Total
Male	2.4	6.1	21.4	51.5	14.7	3.9	100
Female	2.2	6.4	19.2	53.4	16.1	2.8	100
Total	**2.3**	**6.3**	**20.1**	**52.7**	**15.5**	**3.2**	**100**

In addition, about 2.5 million people are drug addict of which 80% are adolescents and young men.(62) Though evidence found the effectiveness of preventing initiation of harmful substance use at an early age(57), school based skill development curriculum were not included neither in education policy nor were advocated in health policy for school based health education except mental health to some extent. The present scenario of addiction and substance using among young and adolescents seriously indicate the need for education and training for the children and adolescents to cope up with forthcoming challenges.

3.2.2 Promote physical activity in school and society:

Physical inactivity has been recognized as 4th leading risk factor by WHO for prevention of NCDs(63). Several studies showed conspicuous evidences of an association between obesity and physical inactivity and premature onset of chronic illnesses.(64) In 2010, out of an estimated 43 million obese children worldwide, approximately 81% were from LMICs, half of which (18 million) were reported to be living in Asia.(65) Adequate physical activity can lead to a reduction of 30% risk of heart disease, 27% risk of diabetes, and 21%-25% reduction of risk of colon and breast cancers along with favourable effect on cholesterol, reducing obesity and overweight.(66)

Childhood obesity is a growing public health problem as Bangladesh Bureau of Statistics and UNICEF has reported 1.4% prevalence of overweight amongst children under 5 years of age.(65) and one in every 10 urban children is overweight due to inadequate physical activity.(67) Scopes of

physical activity can significantly reduce the sedentary lifestyle instead of watching television and playing computer games.(68) Though 70% children had access to the playgrounds either in community or school, only 45% were going to playground.(69) Unsafe and badly equipped playgrounds might prevent children from going as almost 39% of the playgrounds were found unsafe (69) and 38% children were found to be absent from a physical activity class.(69) Evidence shows that endorsed and conducted by the school authority can lead to an increased rate of physical activity(70). This can have an implication for policy to promote school based physical activity with providing education and facilities in school.

3.2.3 Safe and healthy foods in schools and marketing restriction for foods with high salt and sugar:

With the epidemiological transition, a massive change in food and diet has been taken place worldwide and Bangladesh is no exception. Unhealthy diet is one of the global causes of preventable NCDs that claims almost 40% of all deaths from NCDs and one quarter of all deaths around the world in 2009(71). Reduced salt intake and adequate fruits and vegetables consumption can avert 2.5 and 2.7 million death respectively.(66)(66). WHO considers childhood and adolescent obesity as one of the most public health challenges of 21st centuries and 81% of obese children are from LMICs.(65) It is believed that the unhealthy dietary habits developed during adolescence increase the likelihood of overweight, obesity, diabetes and CVDs.(24)

In Bangladesh, there are about 27.7 million adolescents aged 10-19 years of age, among them 13.7 % are girls which make up about one-fifth of the total population.(72) From micronutrients deficiency to obesity and overweight is grave concern for this age group, especially for adolescent girls.(72) About 25–27% adolescent girls are anaemic, iron deficiency in the age group of 14–18 years is 30% and vitamin A deficiency is prevalent in about half(47%–54%) of school going children(72). Though prevalence of obesity is underexplored in Bangladesh, several studies show that current obesity from 6 to 12 years of age is 3.5 % and 9.7% respectively.(24) Obesity in urban children has increased almost five folds in last two decades.(65) Besides, marketing strategies for beverages and fast foods have significant effect on choosing the diet in adolescents and young children(73)(74)(75).There are established evidences of an association between children’s exposure to advertisement and their intention, onset, and consumption patterns of drinking.(75)(Figure-14). In Bangladesh,

malnutrition and inappropriate dietary practices have attributed to an emerging overweight and obesity problem among young children in urban and affluent families.(76) Furthermore, in Bangladesh, many school canteens or cafeterias predominantly sell fast food items rich in sugar and salts with beverages.(76)

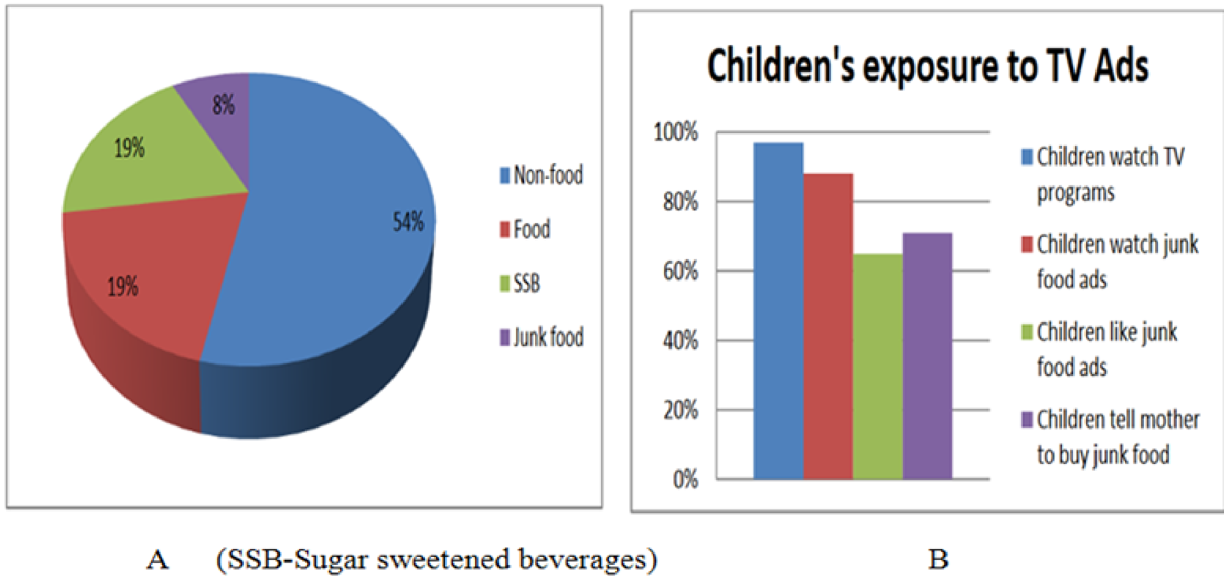


Figure 13: A-Types of television advertisement, B-children response in Bangladesh

Children are influenced by eye catching advertisements where very often these promotions for fast foods or beverages go through prominent cartoon characters or some philanthropic characters along with giant bill boards, flyers, posters and other media. Beverages and fast foods are shown to be glamorous and symbol of high status in media(77).(77) Moreover, adulteration with toxic dyes, chemicals, unhealthy processing and preservatives make the food harmful.(78) In Bangladesh some beverage companies try to attract the children telling their drinks to be refreshing, healthier and even help in growing faster.(79) One study found that children could name as many as ten soft drinks where as they were unable to name more than six vegetables.(79) Malnutrition and micronutrients deficiency is conspicuously related with stunting, wasting or underweight and malnutrition can be improved through promotion of healthy diet by arranging School Feeding Program (SFP) or mid day meal program.(80)(81)

Bangladesh has its food policy and national broadcasting policy, however, it was not mentioned in either of the policies regarding marketing of fast foods

targeting adolescents(82) nor include the school mid day meal that has been proved to be successful in lowering stunting, wasting and underweight in similar context of Bangladesh. (81)(82) HNPSP program encourage some nutritional programs targeting vulnerable groups but not targeting school going children where by now 91% of children age 6-10, 82% children age 11-15, and 40% children age 16-20 go in school in Bangladesh.(16) A food guideline and a food pyramid has been developed, but school feeding program for adolescents was not addressed in its goals for this dietary guidelines.(83) These scenarios intricately indicate the need of reviewing the marketing strategies by food industries and promotion of healthy diet in school.

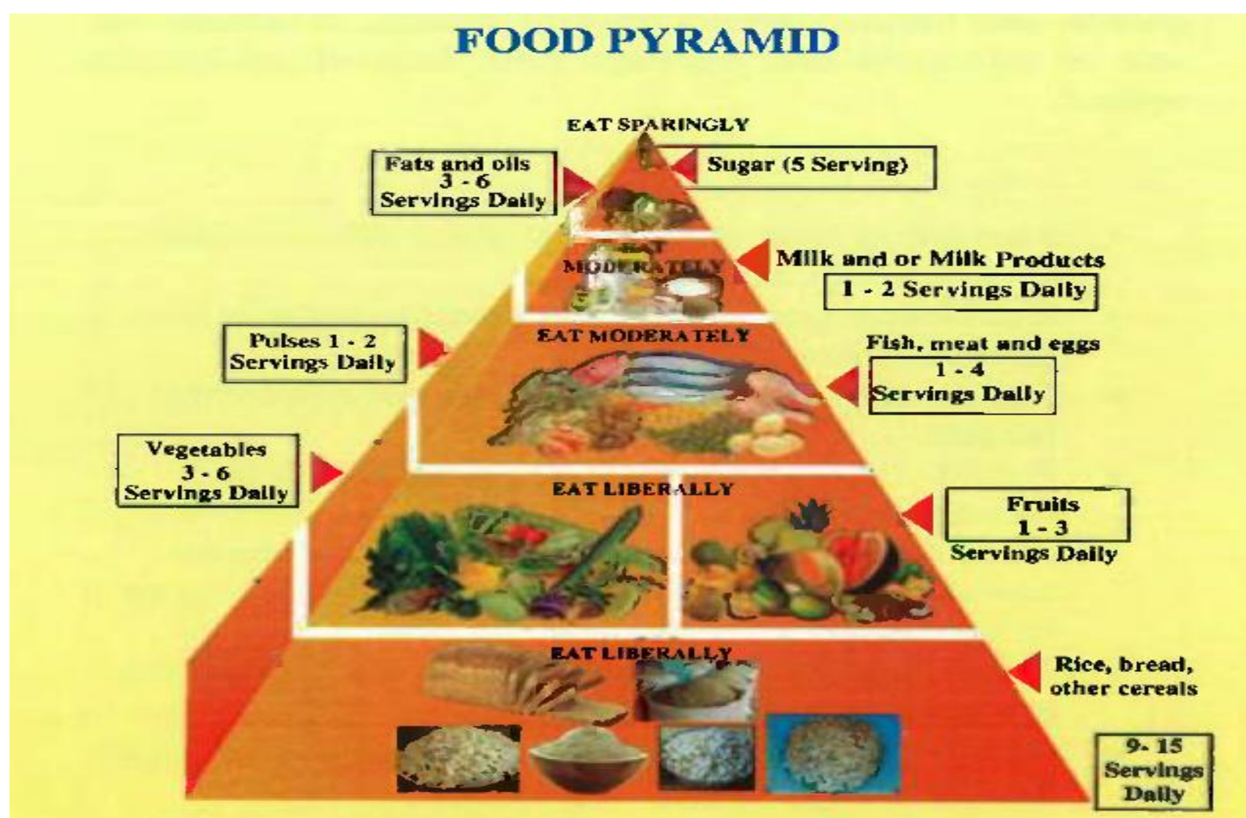


Figure 14: Food pyramid for Bangladesh.(83)

Goals of Dietary guidelines:

- Improve nutritional status of the Bangladeshi population and prevent nutritional deficiency diseases.
- Ensure adequate nutritional status of pregnant and lactating women.
- Prevent and control chronic diet-related disorders
- Maintain health of the elderly and increase life expectancy.

3.2.4 Institute tobacco and alcohol controls:

The increasing trends of alcohol and tobacco use amongst the young in LMICs is another grave global public health concern.(75) In 2012, 5% of all death among children from 15- 29 years of age was due to alcohol consumption(84). 6.9% of in-school youth ages between 13-15 years were tobacco product users, 10% of children aged 13-15 smoke cigarettes and almost half of all children are exposed to the SHS globally.(84) Adolescents who starts drinking before age of 15, are more likely to abuse alcohol.(53) In Bangladesh, it was found that education toward changing behavior and attitude significantly reduces the smoking. Almost 90% people know that smoking is prime cause for lung cancer and it was evident that with the increasing level of education the use of tobacco smoking decreases(61) Moreover, Secondhand smoking is one of the potential threat for for students and rural people as 7 out of 10 student and 66% rural people are the victim of SHS.(85)

The imminent threatening facts of tobacco towards major NCDs have convinced countries to move forward. Bangladesh has signed the WHO FTCT (Framework Convention on Tobacco Control) and also passed an act against tobacco in 2005 and amended in 2013. In the tobacco control policy, Bangladesh banned tobacco products in public places including educational institutions. Smokeless tobacco use is more common in Bangladeshi boys and women in rural areas. Appropriate attention is not paid in policy to address the women in rural areas. Taxes on smokeless products are less than cigarettes.(86) In the tobacco control act, smoking has been banned in public places but no direction was given on smokeless tobacco and home

smoking that could significantly reduce the exposure of SHS among the children and adolescents.(87)

3.3. Adulthood:

World Health Assembly has set up a target to reduce the NCD avoidable mortality by 25% by 2025.(88).The increasing trend may be attributed to various factors like urbanization, promotional marketing strategies of food and tobacco industries, changing life styles. work pattern etc(89).

3.3.1. Improve maternal nutrition:

The early origin of chronic disease has drawn attention on maternal health and nutrition as it is one of the major determinants of the health both for the offspring and mothers. There are numerous evidences of an association between early nutrition and major NCDs.(90). Good maternal nutrition is said to be the best start in life.(91). Maternal undernutrition contributes to foetal growth restriction, LBW, stunting by 2 years of age, non-insulin-dependent diabetes, and hypertension.(90)(92) More than 3.5 million mothers and children under five die each year due to the undernutrition, and millions more are permanently disabled by the physical and mental effects in the early months of life.(93) Gestational diabetes mellitus (GDM) is another form of nutritional imbalances in pregnancy strongly related to obesity and offspring complication.(90)(80)(90)(90)(90)(90)(91) Studies show that over 3 million women die of cancer each year (with an increasing shifting to breast cancer), CVD causes 9.1 million death, 80% of these occur in LMICs, COPD is the fifth leading cause of death among women in LMICs where diabetes takes the 9th leading cause of death with GDM occurs in one of every 25 pregnancies(95).

Nutritional status has been improved notably since 1990, but rising trend of obesity and still high malnutrition has also been observed(16) Among ever married women age 15-49 years, 19 % are undernourished, 25% are overweight and 39% are obese.(16) Vitamin A deficiencies are generally rare in EBF infants, but when the mothers' diets are deficient, infants may have low intakes of certain vitamins (vitamin A, riboflavin, vitamin B6, and vitamin B12(49).

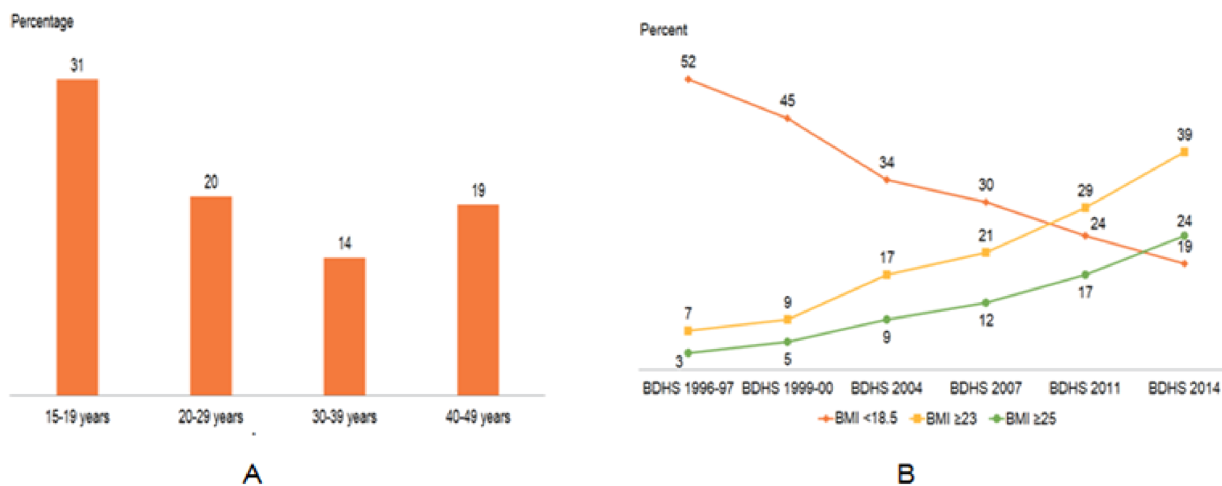


Figure 15: Percentage of undernutrition, B- BMI status among ever married women 15-49 years. Page 171-172.(16)

Maternal nutrition is closely linked with many aspects such as, early pregnancy, LBW babies, iron and other micronutrients those are important for promoting maternal nutrition. In Bangladesh, iron supplement in rural areas is only 15% (96) and only 51% household salts are iodized(96). BINP(Bangladesh Integrated Nutrition program) & NNP (National Nutrition program) started community services to improve maternal nutrition and BINP was successful in community engagement though still two third of the country needs to be covered.(97) Furthermore, maternal nutrition can seriously be hampered by early child marriage and adolescent pregnancy. At present teen pregnancy in Bangladesh is high in South Asia (35%)(98). LBW, which is 22% in Bangladesh, is extremely the outcome of maternal undernutrition.(99) 59% of women age 20-24 were married before age 18, and this scenario has not been changed till 2011 and this indicates a serious public health concerns for the outcome of teenage girls newborn.(16) The Health, Nutrition and Population Sector Program (HNPSP) under MOH tend to emphasize MDG but lacks addressing other determinants those could affect maternal nutrition i.e., work load, consuming fruits and vegetables etc.

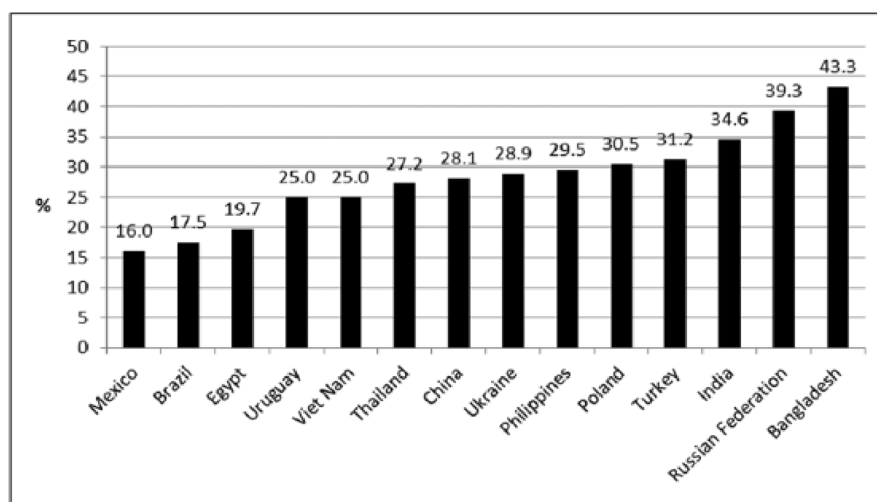
Given the fact of under nutrition and micronutrient deficiency especially iron deficiency anaemia is a threat for maternal condition. At present almost 87% of the children aged 6-15 years go to school(16) and evidences showed that school based iron supplementation program can improve the iron deficiency anaemia in similar context of Bangladesh.(100–102) At present no school based iron supplementation program or community program are running in

Bangladesh(103) and this has its implication for policy to provide school and community based iron supplementation in order to improve maternal nutrition in the long run.

3.3.2 Implement tobacco prevention and cessation programs:

Globally 1.3 billion people smoke and almost six million people die each year which is one in every six seconds from tobacco related diseases.(60)(89)(104). The WB suggests that, if adult consumption were decreased by 50% by 2020, approximately 180 million tobacco related deaths could be avoided.(105) Tobacco being the risk factor for many NCDs and smoking is responsible for about 71% of lung cancer, 42% of chronic respiratory disease and nearly 10% of CVD.(104)

Smoking rate is very high in LMICs compared to developed countries and Bangladesh is one of the highest tobacco using (43.3%) and second highest SHS exposure country(60) in the world making it a dire challenge to prevent people from smoking related NCDs.(106)(89). A recent study conducted using 2010 data concluded that about 25% of all deaths among men aged 25 to 69 years are attributable to smoking leading to average loss of 7 years of life per smoker.(107) The Figure below represents the tobacco use according to GATS (Fig-A) in surveyed 14 countries.(60)



Prevalence of current tobacco use – 14 GATS countries.

Figure 16: Prevalence of current tobacco use in Bangladesh

Till date, the use of tobacco consumption went down but an increase in smoking cigarette has been observed.(107) Many of the smokers 34.6% initiated smoking at the age of 15.(23) Tobacco consumption in any form was always highly prevalent in rural areas and among poor people and poor portion bears the most disease burden.(23)(108). However, women 33.6% are found to be predominant user of smokeless tobacco with betel quid than in men which is believed to be potential cause of stroke, CVD, oral cancer.(23)(109)

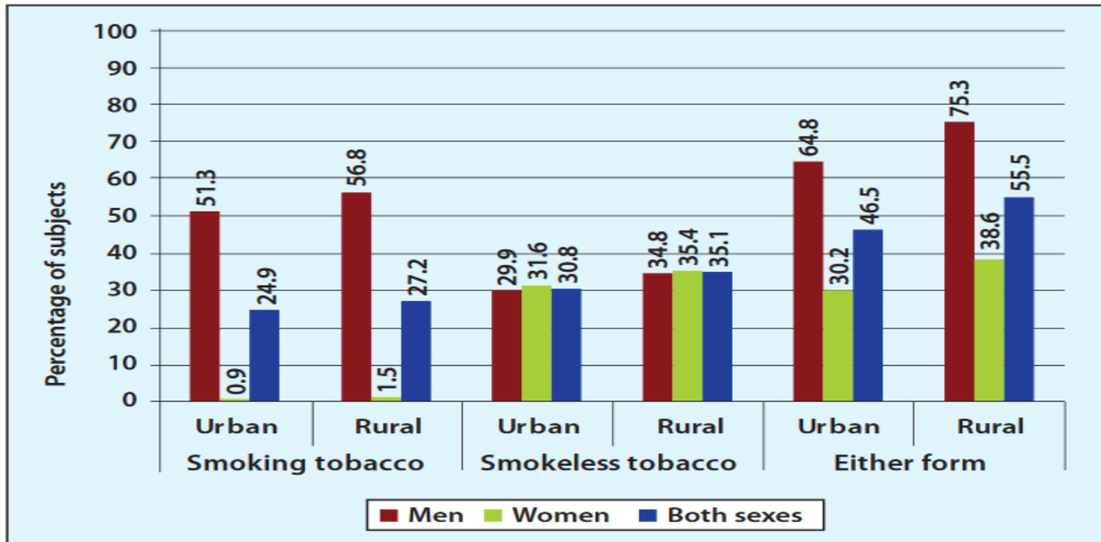


Figure 17: Prevalence of Smoking in Bangladesh in urban and rural areas.(23)

Furthermore, female either smokers or non smokers are the predominant victim of SHS.(Figure-21) Two in every five adult females use smokeless tobacco in Bangladesh but lack in addressing them in tobacco control policy (60) Additionally almost 6 in 10 were exposed to SHS at indoor workplaces, more than 4 in 10 exposed in public places, more than one fourth of all adults were exposed in restaurants and public transports.(85).

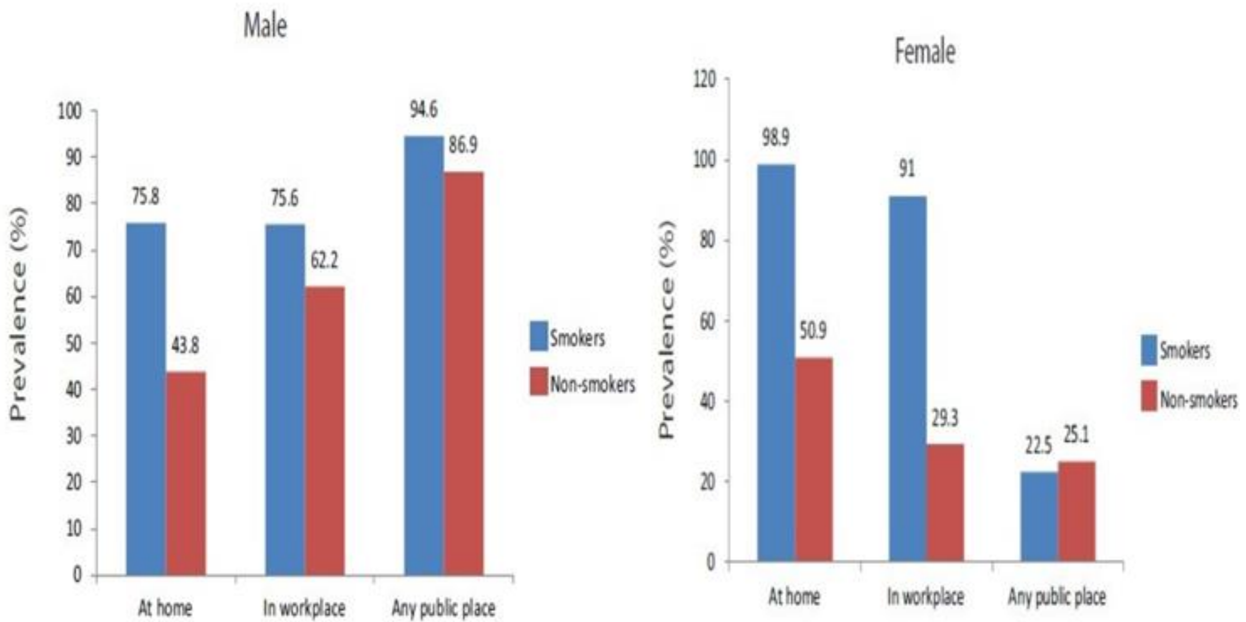


Figure 18: Exposure of SHS at home, workplace and public place.(110)

Bangladesh tobacco control act came into effect in 2005 and adopted an amendment in 2013 with banning smoking in public places, setting the age for selling tobacco products to 18, and making graphic design compulsory, but no intervention was found addressing rural women who are exposed to SHS or use tobacco at home. (87) Among smokers, around 50% saw the anti-smoking information and majority of them saw in the television, newspaper, radio etc but still a great portion is out of reach of media information(85). There are number of organizations working for anti smoking like ADHUNIK, MANAS, Dhaka Ahsania Mission cancer hospital, Bangladesh Cancer Society etc. have been raising awareness programs, human chains, etc, but no one targeting particularly women and SHS(111). These consequences have some implication for targeting the women or students who are using tobacco and being victims of SHS.

3.3.3. Improve availability and affordability of food:

Availability, affordability and utilization of food are the part of food security where sufficient, optimal nutrition and balanced diet is available with having sufficient means to obtain that food and consumed on the basis of nutrition knowledge, sanitation and care.(112) Global food system changes have also had dramatic implications for NCDs by influencing the nutritional quality of foods that are available, affordable and acceptable to consumers.(113). The

unmet goal of eliminating poverty and hunger of MDG where one billion people worldwide are still facing chronic hunger and another one billion are in chronic micronutrients deficient.(114) Producing enough food does not guarantee the appropriate food as the triple burden of malnutrition (undernutrition, micronutrient deficiency, overnutrition) is closely tied to food security.(114). While food may be readily available, healthy foods are increasingly inaccessible in terms of price, location, or for other barriers. Dietary quality and insufficient fruit and vegetable intake are risk factor for NCDs, which WHO estimates to cause 1.7 million deaths each year.(114)

Bangladesh is not currently food secured in terms of receiving total calorie coming from protein and fat. About half of the population cannot reach the minimum dietary energy requirement (2122 kcal/capita/day) and one quarter of them are in extreme shortage of energy, consuming less than 1800 kcal/capita/day(112).In recent years, though Bangladesh has been able to produce enough food especially in cereal (mainly rice) but it was not accompanied by availability of other foods.(115) However, food basket varies by economic disparity, rural and urban settings, distribution which affect for not being food secured adequately.

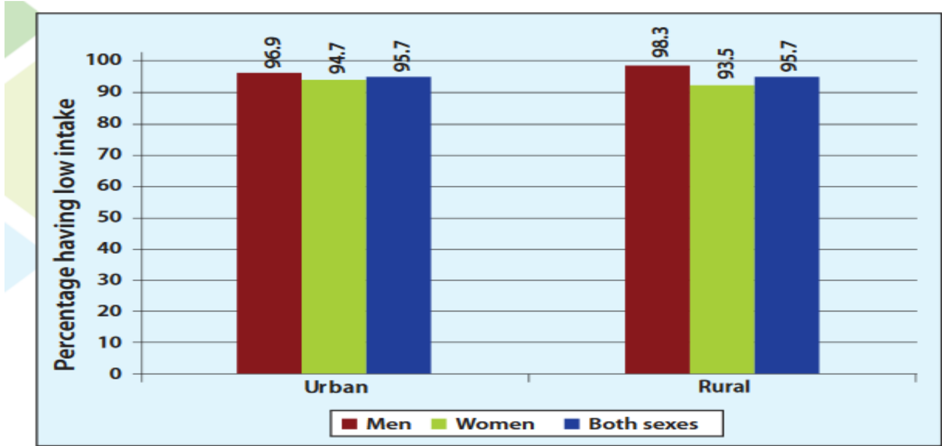


Figure 19: Prevalence of inadequate intake of fruit and/or vegetables (< 5 servings/ day) in rural and urban area(23)

Food cost is a barrier and therefore healthy food which is always costly is out of reach of many people and are forced to go for unhealthy diets(115). In resource poor settings, promotion of the appropriate dietary practices for children under two years of age has less impact on economically vulnerable families due to inabilities in purchasing foods.(116) While most of the people are poor and live on agriculture where seasonal harvesting influence

their dietary diversity to meet the adequate nutrition from meat, fish poultry, vegetables or fruits. Almost every study found that poverty, seasonal variation, policy affects the balanced diet which is related to well being and NCDs.

3.3.4. Encourage physical activity (worksites, urban design):

Physical inactivity is strongly associated with the increased risk of many major NCDs along with shortens life expectancy.(117). WHO estimates that physical inactivity is the fourth leading risk factor for global mortality and is responsible for around 3.2 million deaths globally per year, of them 2.6 million from LMICs. (63) Study found that, minimum physical activity in individual compared with no activity can lead to a reduction of all-cause mortality by 19% with lowering a 31% risk for all cause mortality.(117) In Bangladesh, overall 45.7% of the survey populations were found not engaged in work related physical activity, around 44.5% reported no transport related activity and around 81.9% had not engaged in any leisure time physical activity (Figure-23)(23). Women were found three folds more inactive than men in Bangladesh(118) At present in south east Asia Bangladesh has the second highest diabetes prevalence and also had a mean age of myocardial infarction (MI) of six years lower than other south Asian countries with highest prevalent risk factors and lowest physical activity.(119)(120).

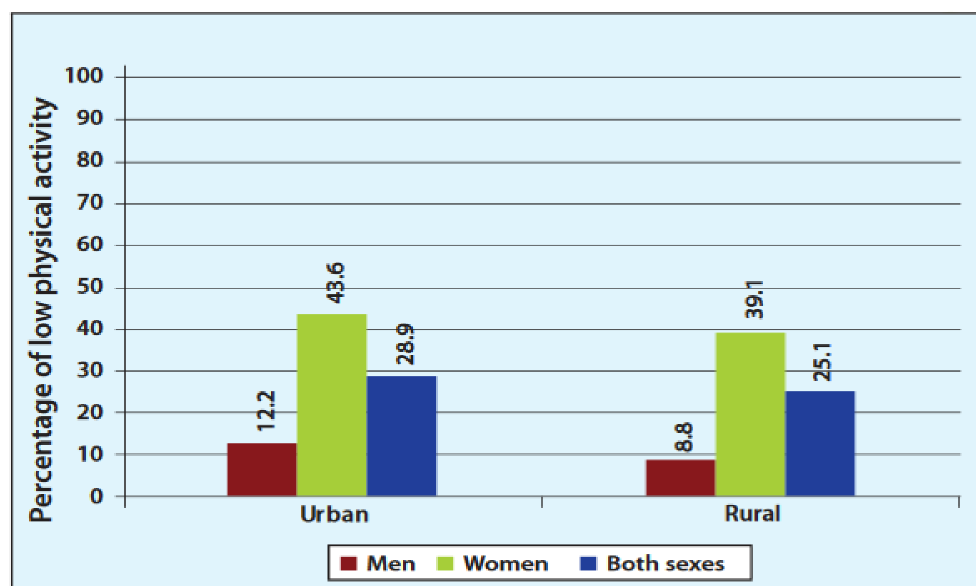


Figure 20: Present physical activity level in Bangladesh.(23)

Rapid urbanization has been influencing work pattern leading to sedentary lifestyle causing less physical activity(121) and reduce walking path by using the places for commercial purposes, illegal parking and makeshift shops causing less walking habit in city dwellers.(122) Evidence suggest that walking can contribute less traffic related air pollution causing COPD and CVDs.(123) Moreover, people are being accustomed to using the modern technologies even in agriculture, industries, home leading to a significant reduction of physical activity(124). Moreover, unemployment was found to be another factor for reduced physical(118). Social cultures very often limit the outing of girls and women thus restricting social activities and movement.(125) Other social determinants are unsafe walking path, high crime prone areas, no bicycle lane, cultural attitudes toward women lead to less physical activities.(118) Evidence suggests that multisectoral approach including involvement of non health sectors are needed to facilitate physical activity.(126). Bangladesh has set a physical activity pyramid to scaling up the physical activity in the country, but it needs the multisectoral harmonious collaboration(126). All these have an implication of harmonious cooperation among different ministries to promote physical activity in either in work place or designing urban places.

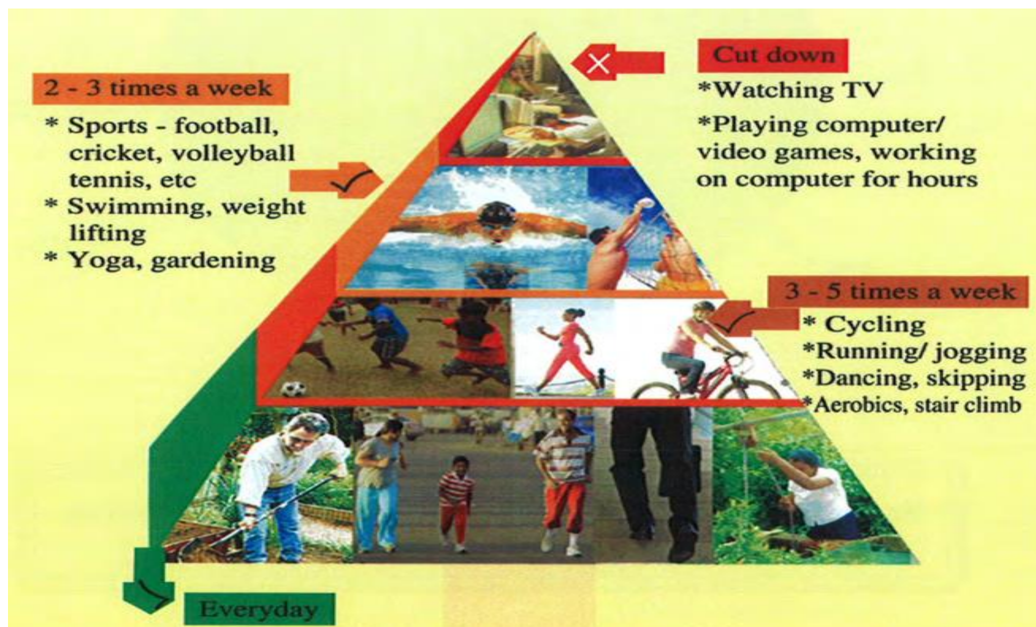


Figure 21: Physical activity Pyramid, Source: Book- dietary guideline,(83)

3.3.5. Provide access to effective prevention and care of risks and disease:

Prevention and care has also been prioritized in SDG(Sustainable Development Goal) and Global Monitoring Framework for NCD by setting different targets of reducing salt/sodium intake, tobacco and alcohol use, insufficient physical activity, achieve 80% coverage in essential NCD medicines (including generics) and technologies. (127). The economic costs of diagnosing, treating, and providing long-term management for NCDs are astronomical for low-resource health system. About 61-68% of the total disease burden is accounted for NCDs and in coming years Bangladesh is going to face NCDs burden due its large number of aged person (above 70 years) by 2050.(128)(129) Though a good quantity of primary health care system persists in Bangladesh, but effectiveness, workforce, skill, equipments, knowledge and promotional activities are still grave concern.

Effective prevention and care to NCDs is mutually reinforcing and needs multisectoral approach. Poverty and NCDs make a vicious cycle that pushes people into impoverishment and long term sufferings and refrain people from seeking care.(17) The low level awareness about the existing NCDs also puts a great threat. For example, about 51% of the total population is unaware about the diabetes and 56.0% were unaware they had the condition which will increase the likelihood of the projected incidence (Figure:23-24). (37)(142),

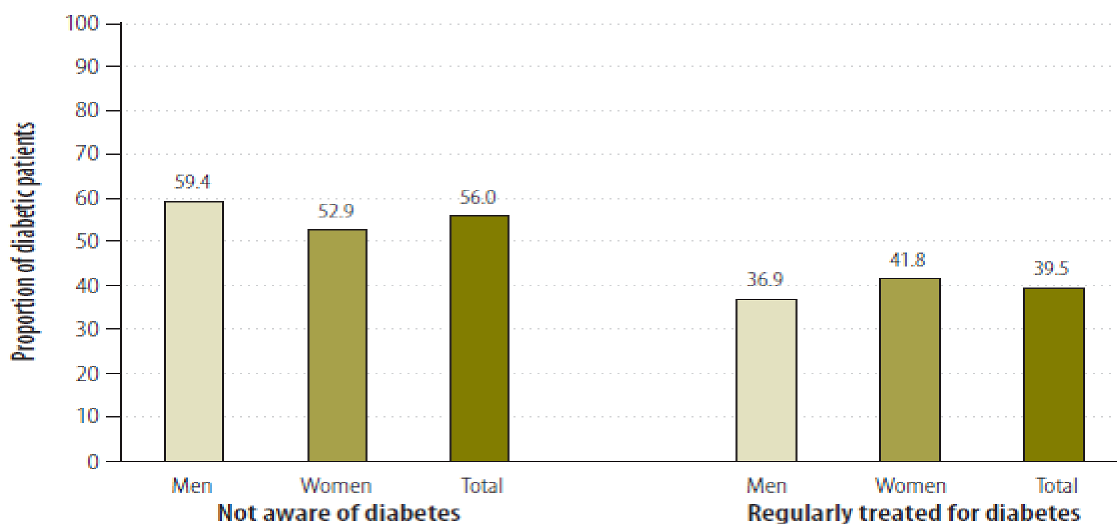
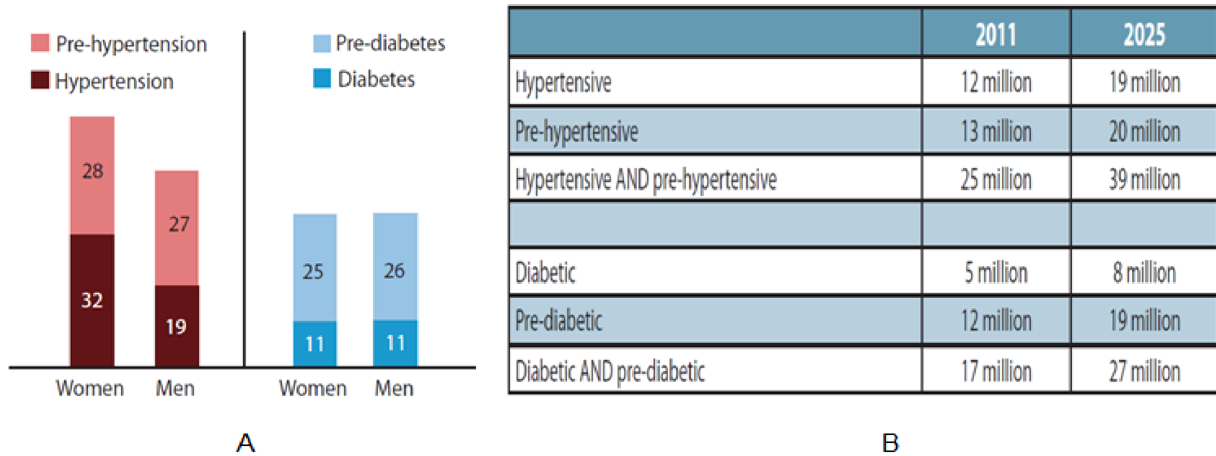


Figure 22: Awareness of the people aged 35 and over and receiving regular treatment.(130)



	2011	2025
Hypertensive	12 million	19 million
Pre-hypertensive	13 million	20 million
Hypertensive AND pre-hypertensive	25 million	39 million
Diabetic	5 million	8 million
Pre-diabetic	12 million	19 million
Diabetic AND pre-diabetic	17 million	27 million

Figure 23: A represents the prevalence of hypertension and diabetes, B represents current and projected people living with hypertension and diabetes(37)

Bangladesh health system focuses on the treatment rather than prevention and promotion even in PHC. Having only 7.7/10,000 qualified healthcare providers though not trained on NCDs is giving services along with for the infectious diseases(25). Secondary prevention can also prevent premature deaths by at least 70% of high risk people, for example polydrug treatment for CVD can prevent approximately 20% of deaths(127). Many people do not know they have diabetes or hypertension as these diseases remain asymptomatic unless it becomes complicated.(131). Adherence is also particularly important for NCD prevention and control because patients are often unmotivated to seek care and uninformed about risks and potential outcomes and go back to their previous habits.(127). Data indicates, programs targeting care of major risk factors could reduce the burden of NCDs by more than half, with costing only a fraction of current health spending.(132) The NCD strategic plan indicates promotion for prevention of NCD risk factors only in district or municipality level and specialized care is limited to some health institutions(1) which literally indicates the low care of the existing condition and risk factors.

Chapter 4: Evidence based interventions to improve the NCDs in different stage of life:

From the study, several gaps have been identified in different stages of life. However, evidences from LMICs in similar context have been presented to be contemplated for application in Bangladesh.

Table 4: Summarized Study Findings/Gaps:

Level	Gaps	Consequences
Infancy	Lack of policy to facilitate EBF working Mother in work place or community.	Children are inadequately fed due to forced bottle fed with commercial feeding, inappropriate and inadequate feeding by caretaker leads to early malnutrition.
	Lack of promotional effort and attention in food policy and CF guidelines for using local food for CF and advertisement of processed baby food.	Advertisement influence early stop of EBF and initiate early CF. Cost of other than local food cause low intake of adequate CF.
Adolescent and childhood	No LST in school curriculum	Less development of mental competencies to cope up with substance uses.
	Less provision of physical activity and alternative sports inside school.	Inadequate physical activity, sedentary habit lead to obesity, increase risk of CVD in later life.
	Lack of clear instruction in broadcasting policy regarding fast food advertisement targeting adolescents and availability of fast foods	Children addicted to fast food items causing high intake of beverages and fast food rich in sugar, salt lead to childhood obesity, diabetes and

	and beverages in school canteens /cafeterias.	other NCDs.
Adulthood	Lack of addressing in nutritional programs for rural women particularly to prevent early maternal micronutrient deficiency.	Early micronutrient deficiency specially irons deficiency anaemia lead to LBW baby and other maternal complication during pregnancy.
	7. Low address in high use of smokeless tobacco and exposure of SHS among rural women.	Tobacco related illness.
	8. Low awareness about existing condition.	Need tertiary care causing catastrophic expenditure.

4.1 Infancy:

4.1.1 Breastfeeding:

Arranging physical arrangement such as, private place for breast pump, onsite child care, storage facility at workplace in Hong Kong found to be cheaper and easiest way to facilitate BF. In addition, a work place supporting policy for breastfeeding including presence of breastfeeding committee to increase receptivity among other workers significantly improved the condition in Hong Kong(133). However, without breastfeeding policy, only providing environment may not work as happened in one private company in Taiwan.(134) Private companies around the world also have some evidences to promote BF for the working mothers; however, their outcome is yet to be evaluated. In Thailand, 'Sansiri PLC' in partnership with UNICEF, in Kenya, a program called "better business practice for children" through workforce sensitization, protected time and private area encourage BF for the working mothers.(135) Considering the context, workplace breastfeeding policy and arrangements to support the working mother can be effective for Bangladesh as booming private sector needs to be addressed under the

maternal leave policy and encourage EBF in working mothers with physical arrangements.

4.1.2. Complementary Feeding:

Food availability, economic status and local culture influence feeding habit.(136) Training to formal and community health workers for the intervention in improving the nutritional status of the children of 6-24 months and feeding behaviour of the parents became successful in Bangladesh, India and Brazil.(137) Studies in rural South Africa and Thailand have shown that nutrition education programs undertaken by trained local women improved infant feeding practices(138)(55) and in Thailand, rapid reduction was observed in underweight children from 36% to 13%.(55). Robust evidences in fortifying the CF for the improvement of the nutritional status of the children from LMICs show that along with animal source vegetables, fruits, rice or maze can greatly improve the nutritional condition of the children.(139) However, the interventions do not particularly indicate for using only the local food as CF. Therefore, in applying the intervention, context and culture along with micronutrient deficiency should be considered.

4.2 Adolescent and childhood:

4.2.1 LST in school:

Adolescent and childhood is the most important time for developing habits that usually influence lifelong. ‘School mental health program’ through LST was conducted in 1996 in four districts of India (Bangalore urban and rural, Udupi, Haveri) covering 261 government secondary schools. After one year, teachers reported about the positive changes within the students in class room behaviour, coping up with stress and self esteem. The program was mainly conducted through health education lectures.(140) Class room education regarding oral health was found to be effective to reduce dental caries in Bangladesh.(141) Positive effects were found on antidrug education and development of mental competencies in Hong Kong through LST in schools(142). Considering these evidences, LST can be applied in school curriculum to facilitate the better understanding of the healthy behavior to prevent risk factors for NCDs.

4.2.2 Physical Activity:

Srilanka, being one of the neighbouring countries, adopted the physical activity on school going children in the form of 20 minutes early morning running program. In school, exercise program, dissemination of health messages as well as training of school teachers on physical activity and health under 'Diet and Physical activity program' has been implementing. They also incorporated it outside the school named 'Move for Health' where educational and promotional materials were distributed in the community. (70) In Samoa, school physical exercise curriculum was made compulsory(70) In addition, a 500 km run in Bhutan initiated by sports minister drew the attention significantly to increase the physical activity for general people.(70) A community based physical activity program initiated in collaboration with different stakeholders was successfully implemented in Dhaka, Bangladesh. The program was comprises an area of 7.7 sq. Kilometre involving15 members community coordination committee including local political leaders, school/college teachers, community leaders, local sports clubs and volunteers spreading messages with leaflets, rallies, suitable environment.(70)

4.2.3 Unhealthy food and restriction of marketing and introduction of mid day meal:

Cape Verde, a LMIC, introduced school meal program with local resource targeting 9000 primary school children from 31 schools reported to be improved nutrition with some extra income of the smallholders. Cape Verde engaged producers, suppliers, arrange training to the teachers and cooks. A significant improvement in underweight, stunted was found in children and adolescents. Being in similar context in terms of undernutrition and income, Bangladesh can apply this lesson to improve the nutritional status of the children and also can create some employment and business opportunities for local people.(143) Similar result of improved nutritional status were found in Karnataka state in India following introduction of mid day meal program.(144) Study conducted by the World Diabetic Foundation through 17 different projects in different LMICs identified three particular themes those can promote healthy eating among school children: 1.Policy for involvement of different stakeholders (MoE, District education office, School authority, parent and community), 2) through health education lecture classes, 3) interactive participation such as quizzes, poster making, debates, drama, role plays, cookery lessons, lunch box competitions, sports competitions etc can lead to significant changes in lifestyle and food choice

among students. Moreover, one important lesson learned from these projects is, emerging processed food can be controlled through restricting sale of unhealthy food in and around the school premises and preferential pricing of healthy food in school canteens should be addressed to help them making healthy food choices.(58)

Corporate responsibility can lead to reduction in beverages and fast food choice. In India, coca cola agreed not to promote its product to children under 12 years and indicated the classrooms as commercial free zone(145), In Trinidad and Tobago, education intervention among adolescents lead to lower intake of fat, sugar and fried food.(146) Similarly in Northern part of India, nutrition intervention lead to improved knowledge and lower consumption of sugar-sweetened drinks and energy dense foods and increased fruit consumption(24).

4.3 Adulthood:

4.3.1 Addressing iron deficiency anaemia to improve maternal nutrition:

Prevailing condition of iron deficiency in Bangladesh among school going children has enormous effect later in motherhood. A study on the adolescent school girls from a government girl's school of Northeast Delhi clearly found the improvement of the level of haemoglobin following weekly iron and folic acid supplementation. It was found effective and practical though it took a relatively long time for the improvement.(147) Similar results were found in another study from Monaca province of Mozambique. Iron and folic acid supplementation in among girls aged 11-18 years supervised by the teachers was found to be preventive against drop of haemoglobin level and anaemia.(148)

4.3.2 Addressing rural women to reduce smokeless tobacco:

Community based tobacco intervention program was conducted in a low socio economic area in Mumbai, India for one year. This program involved health education, games and counselling session and a post intervention follow up. Though only 33.3% were successful in complete quitting, but compliance with the program was very high 91%. Since tobacco is addictive, hence its withdrawal effect may cause failure attempt. However, quitting attempts after the intervention was quite significant. Given the context with high prevalence of tobacco users in rural area of Bangladesh, this kind of program can have significant effect(149).

Tobacco control programs and interventions are done mostly in developed countries, but these can also be applicable at the same time in LMICs. WHO developed MPOWER to help FTCT and this technique proved successful. Turkey is the dazzling example to reduce tobacco which was highest tobacco using country in the Europe and now became the third country who makes 100% smoking free indoor and smoking was reduced to 13.4% by 2012 and can be assumed of less SHS.(150) For the cessation of tobacco, graphic health warnings are found to be most cost effective intervention to educate people regarding tobacco. (102). India and Thailand have implemented graphic health warning on various tobacco products and due to its positive effect many other countries are in the process of implementing such warnings.(60).

4.3.3 Providing care for existing condition:

Different promotional measures are also taken in some LMICs for effective prevention and promotion to take care of the existing risks. In Sri Lanka, HLC(Healthy Life Clinics) are established to screen risk populations for early detection and to inform the public on risk factors to reduce the incidence of NCDs.(151) UAE, with MOH and a private pharmacy company named 'Bin Sina Pharma' conducted awareness program through education and information dissemination targeting obesity, diabetes and other conditions. 'Bin Sina Pharma' provided examination, assistance and check up with a consolidated discount that revealed a new 27000 people with high cholesterol. They set up a discounted option and a free hotline that provide real time information about medicine and present condition.(132)

Table 5: Evidence based intervention to address NCDs in different stages of life

Life Stage	Area of intervention	Country	Intervention	Outcome/Impact
Infancy	• Breastfeeding for working women	Hong Kong(133)	Physical arrangement for breastfeeding Breastfeeding suitable environment Breastfeeding committee Workplace Breastfeeding policy	Increased the breastfeeding rate among working mother
		Private companies:		
		San siri PLC (Thailand)	Well-equipped private breastfeeding room with hygienic breast milk storage facilities.	
		Safaricom, one of the country's leading mobile phone service, (Kenya)	Provides comprehensive maternity insurance cover, flexible working hours and state-of-the-art workplace breastfeeding	

			facilities.	
	• Complementary Feeding	Bangladesh, India, Brazil, Thailand	Nutrition education by CHW, Community nutrition education	Improved feeding behaviour Rapid reduction of underweight children from 36% to 13% in Thailand.
Childhood and Adolescent	Life Skill Training	Four districts in India Bangladesh Hong Kong	Mental Health education program Oral Health Education Sexual and reproductive Skill with mental competencies	Improved class room behaviour, mental competencies. Improved Improved

	Unhealthy food in School and restriction on marketing	Cape Verde,	School mid day meal program using local resource	Improved nutritional status along with increased income of local vendors
		Karnataka, India	School mid day meal program	Improved nutritional status among students
		World Diabetic federation	17 projects in LMICs: Policy environment Health education lectures Interactive activities	Recommended
Adulthood	Improving maternal nutrition	New Delhi, India Monaco Province, Mozambique	School based iron and folic acid supplementation	Improved Nutrition status.
	Smokeless tobacco among women and SHS exposure	Mumbai, India	Community based tobacco cessation program	33.3% complete quitting with significant quitting attempts among others.
		Turkey	MPOWER(WHO)	100% indoor smoke free. Reduced smoking to only 13.4% in Turkey

	Care of existing condition and risk factors	UAE	Check-up, examination, follow up with a private pharmacy at a discounted rate	27000 high cholesterol new cases were identified.

Chapter 5: Discussion, conclusion, recommendation:

5.1. Discussion

The findings indicate multiple factors needed to be addressed for health promotion to prevent NCDs in Bangladesh. The evidences also indicate some contextual factors specially socio economic and socio cultural context those influence personal behavior as they cut across almost all factors throughout the life.

However, themes in light of findings and evidences have been chosen for discussion. Some themes have been taken into consideration together as they are interrelated, for example, facilitating physical activity for adolescents might help in adult physical activity, tobacco cessation program in community may help reducing adolescent tobacco consumption. Though interventions in section 4 are evidence based in almost similar context, specific recommendation after discussion may not be strictly the same.

5.1.1. Infancy:

5.1.1. a Breastfeeding:

Though almost all children are breastfed in Bangladesh but EBF is still lagging behind and is in decreasing trend.(16). EBF depends on the factors such as the maternal nutrition, lack of knowledge about the technique, family and community support, fear of losing job or not having supporting environment in workplace. One of the causes found for not scaling up the EBF is the growing number of working mothers specially in booming private sectors in Bangladesh.(42) This argument also supports the recent trend of increased female workers and on the other hand a decrease in EBF found from BDHS-2014 survey than the previous survey in 2011. In addition, many of the private sectors do not follow the maternal rule delivered by government.(42) This leads the thinking of introducing breastfeeding policy with representative from civil society or organization like BBS(Bangladesh Breastfeeding Society) to supervise the private sector work place. Because of the fear of losing job, many women try to return to their job as early as possible keeping their child to mother in laws or to caregivers.(43) Introducing breastfeeding policy in workplace with providing physical arrangement along with applicable maternal law, this scenario may be improved as happened in Hong Kong. This situation urges the urgent multi disciplinary intervention needed to improve this condition.

5.1.1.b. Complementary Feeding:

Complementary feeding is one of the unforeseen challenges for growing babies in Bangladesh. Inadequate EBF and CF are closely associated with child obesity and cognitive development, different types of cancers, maternal depression. Study found inadequate EBF and CF as important causes of malnutrition which results in high prevalence of stunting, wasting or underweight children.(31) In Bangladesh, only 23% of the children are fed with CF according to IYCF guidelines.(16) One of the possible explanations for this inadequate and inappropriate CF may be due to the fact that trendy CF rich in meat, fish or other animal sources are of high cost.(52) Along with this, there is huge information gap regarding food values of locally and readily available foods. In addition, triggering factor may be the processed canned food advertisements that may provoke mothers to start early expensive processed canned food as CF. Despite having adequately nutritious and low cost local foods, these are very rarely used for CF.(45) They also have very little knowledge about the hygiene and processing of local food for CF. Moreover, all focuses went on the breastfeeding as the prime intervention and thus CF got less priority to talk about the local food fortification. To prevent the malnutrition, advocacy is very urgent for CF those are rich in micronutrients and readily affordable. However, evidences from the same context also support for the urgent need of advocacy for promotion of the local food as CF. However, using local food as CF should be implemented in caution and taste, culture, nutrients deficiency should be taken into consideration.,

5.2.1. Childhood and adolescent:

5.2.1.a Improve life skill education:

Life skill education are related to self-motivation, self-control and regulation, resilience and coping thus helping in having control over personal behavior. It was found very effective in reducing tobacco or alcohol consumption initiation, coping with mental stress, choosing particular practices. (56) By achieving early control, one can avert himself from all detrimental behaviors that lead to NCDs in later life. This transitional effect necessarily puts the importance to help the adolescents making the best choices from food habit to sexual and reproductive life and to offer them a good start of life. Studies show that early behavior usually persists lifelong and thus it is useful if it is

learnt in childhood. (55) Evidence shows that early initiation of tobacco is high in Bangladesh i.e. 38.7% start smoking at the age of 15-19 and 20.1% at the same age group use smokeless tobacco.(86) Another possible example can be the making of food habit choice, as recently fast food and beverages companies are growing fast and it may not be always easy to tackle with the giant food industries. Evidences showed involving LST in school significantly improved knowledge and behavior towards the healthy food choice, sexual and reproductive life, family planning, anti-drug behavior and contraceptive use. MOH can advocate for this to MOE to take necessary steps to include LST in school education curriculum that may have a significant reduction in NCDs in later life.

5.2.1.b. School Physical activity:

Physical inactivity has conspicuous association with the early onset of major NCDs and premature deaths. Recently there are increasing numbers of obese and overweight children in Bangladesh and pattern of prevalence significantly indicate life style related activities. This also correlates the finding of less physical inactivity in urban child due to fewer scopes of open spaces and play grounds in urban schools. Study found that inaccessibility and not attending the physical exercise classes are the causes for not having physical activity. One of the potential causes may be the lack of safe playgrounds (study found only 39% are safe) with fewer scopes for alternative sports such as swimming, dancing, walking or cycling. (69) Physical activity can help in reducing the habit of watching television and playing computer games. Different initiatives from different countries proved school based physical activity to be effective in reducing child obesity. Promoting suitable environment such as safe play grounds, alternative exercises like swimming, dancing, walking can be very encouraging to students for the development of individual behavior. Physical exercise teaching and compulsory attendance in early morning in school would also be helpful in Bangladesh as happened in Samoa and Srilanka. (70) This can be assumed from previous finding that habit developed in childhood will certainly help initiating physical activities later in life.

5.2.1. c. Safe and healthy food and restriction of unhealthy food in school:

Healthy food and diet is important from the conception to the old age. Due to globalization and urbanization, a massive dietary change has been taken place globally. Alarmingly, promotion of fast food through media targeting the children is worsening the condition even more as one study found that many students could name the sugary drinks rather vegetables.(79) Furthermore, it was found that fast food items are predominantly sold in the school or college canteens instead of local healthy vegetables or fruits.(76) SFP can also incorporate the local nutritious vegetables and foods and can promote for school meal like other countries did. While talking about healthy diet, adolescent girls which comprise about one fifth of the total population need particular attention to prevent anemia or other micronutrients deficiencies as their nutritional status is also going to have a significant effect on their offspring. One possible argument for taking initiative to improve maternal nutrition in adolescent period may be this is the age when the girls start their reproductive life. It is important to address the adolescent girls on the ground that teen age pregnancy is still high in Bangladesh leading to undernutrition that eventually makes unhealthy life(98). However, among many other nutrients, iron supplementation can be prioritized to implement in school due to the widespread deficiency among adolescent girls along with SFP to reduce the iron deficiency anemia.(96) SFP can improve the utilization of local nutritious vegetables and fruits as evidences say that plant based diets help reducing obesity, high blood pressure and control the cholesterol level to make a healthy future generation.

5.3.1. Adulthood:

5.3.1.a. Tobacco prevention and cessation programs:

Tobacco is one of the most threatening factor for the NCDs as it has different implications in different NCDs. Bangladesh is one of the highest tobacco users in the world with 43.3% people are habituated with tobacco use, either smoking or smokeless.(60) There is also a negative effect of being exposed with SHS which is also reported to be second highest in South Asia. SHS has established evidences of NCDs especially on pregnant women and children. Adverse reproductive outcomes and LBW babies were reported with maternal exposure to smoking. Thus active smoking and SHS can be mutually reinforcing as a risk factor. Due to the fact that women are more victims of SHS at home, workplace or in public places, the negative

outcomes are also apprehended more in case of women. Rural women also were reported to use smokeless tobacco more than others.(109) Furthermore, promotional activities in rural areas are reported to be high and supposed to be the cause of high smoking prevalence and SHS exposure (85). WHO MPOWER has been proved to be effective in tackling tobacco problem but proper implementation is necessary as done by Turkey.(150) As graphic warning was reported to be effective in India and Thailand, it can also be interpreted as warning component of MPOWER tool. Additional BCC should be incorporated with community based intervention that will address rural women to stop using smokeless tobacco. Possible intervention through LST among school children for behavior change is can also be contemplated that will help reducing tobacco consumption both in adolescents and in adult life.

5.3.1.b. Provide access to effective prevention and care of risks and disease:

Bangladesh health system is generally poorly organized with absence of effective service delivery and trained health workforce. Data suggests that Bangladesh has a mortality of 17% from CVDs, 3% from diabetes, 10% from cancers and 11% from COPD which are growing faster than ever before.(11) Awareness among the people and health workers is found to be an obstacle. One possible explanation for this unawareness may be NCDs being asymptomatic, many people even do not know they have been living with chronic diseases and they don't feel the need for care. This implies the necessity of disseminating the knowledge and information among people and training need for health care providers in the PHC level to reach the population in large. This scenario also implies the need for screening of the new cases for future care about the existing cases and care of risk factors.

Secondary prevention and care of risk factors have been proved to be effective in reducing mortality thus indicating the importance of providing facilities.(127) PHC centers can be turned into centre of information and primary care for the NCDs for the people coming to seek treatment following the BIRDEM example. BIRDEM extensive network has been providing treatment and care for the diabetic patient countrywide and disseminating information about diabetes through their sub-centers. This can possibly be linked with extensive PHC settings of Bangladesh that can act as major information dissemination centers. This can be augmented for increasing the

capacity of NCD screening at PHC. In NCD strategic Plan, care has been addressed to the district and municipality level centers.(152) Study found that people rely more on the information disseminated by health workers thus information provided by the health care providers about the existing condition from PHC would be receptive among people.

5.2 Conclusion:

NCDs are slowly progressing diseases which affect people slowly but comprehensively thus compounding not only the disease burden, but also cost economic and social development. The continuously changing social and environmental dimensions have shifted the focus on prevention and promotion of the risk factors those were not even in consideration a few decades ago for Bangladesh. Currently, 60% of the total mortality is accounted for the major NCDs such as CVD, COPD, cancer, diabetes and apprehending this sharing will increase in coming days affecting all ages.

In recent years Bangladesh has made a significant improvement in the health status but considering the prevailing NCD risk factors along with unexplored pre existing condition with poor attention toward NCD promotion put Bangladesh into a stiff position. NCDs can be the threat from very early in life and continues to be a threat throughout the life. The NCDs risk factors are so interrelated that any risky event in any stage of life can trigger the future consequences. With the epidemiological transformation, changes in life style, work pattern, and pattern of food consumption, nature of physical activity or type of substance abuse also change. For example, in recent years, working mother emerged in such a great number that was quite surprising a decade ago. Consequently, question arises about the breastfeeding working women and support at workplace for breastfeeding to adapt this change. Breastfeeding along with appropriate and affordable CF should be considered because of the present inadequate attention that is what creating the grounds for future NCDs in Bangladesh. Similarly personal behaviour that actually develops in childhood needs to be addressed for tackling the forthcoming risky events. School based learning can be the best way of developing habits that will influence lifelong. However, promotion alone cannot be the main focus where as creating opportunities for building healthy behaviour asks for the same importance. There is a high rate of tobacco consumption among men, women, and adolescents with increased exposure of SHS, decreasing the physical activity in all ages, increasing taking the unhealthy food among students and adults, widespread

malnutrition among teenage girls really put Bangladesh against the wall. That is the reason a life course approach needs a multisectoral intervention that will target promotion from infancy to adulthood. Educating people about the danger of the tobacco smoking will be synergised if effective grounds can be provided. Likewise, informing the benefit of physical activity will be boost up when there will be suitable and culturally acceptable environment to practice exercise.

The curative focused based health system of Bangladesh lacks adequate trained health workforce with appropriate logistics to tackle the existing condition. In addition, trained people are needed for health promotion as people rely more on the information delivered by the health workers. This links the importance of adequate training, capacity building and continuous professional learning to address the continuously changing need of people. A widespread network of PHC throughout the country can serve this purpose more effectively making them as a primary source of intervention as already done by the BIRDEM throughout the country to reach the people.

NCDs, being silent killer, however paradox is people also remain silent in many occasion and overlook the existing condition. NCDs being epidemic itself, it can never be challenged through individual intervention. Bangladesh needs to realize the most effective intervention that can be provided through already established PHC settings where applicable. When considering the comprehensive effect of NCDs and count the cost of care, disability, impaired production and mental wellbeing, a country like Bangladesh will certainly pay a high price if appropriate measures are not taken at right time. Prevention has always been proved to be most effective and feasible intervention. The benefit of health promotion in different stages of life is promoting one factor can also influence other risk factors so as to building a mutually reinforcing preventive approach. With significant attention to the breastfeeding and CF, LST in school for developing the healthy behaviour in adolescent, promoting the overlooked rural women for tobacco consumption, SHS and taking care of the existing condition can certainly reduce the burden to a great extent.

5.3 Recommendation:

This section provides recommendations on addressing the potential constraints for successful health promotion in Bangladesh for prevention of NCDs based on lessons learnt from other countries. It is noteworthy that

recommendation can only be successful with the involvement of different stakeholders needed for the interventions. The following recommendations are organized according to the gaps found in different stages of life where various actors and stakeholders can take responsibility in a coordinated system.

1.Encourage and increase the optimum breastfeeding for working mothers:

To the policy maker:

- Policies should be formulated to facilitate or support the breastfeeding working mothers in the workplace with adequate physical arrangement for breastfeeding.

For Service providers and stakeholders:

- Maternal leave act which is now very poorly followed by the private sectors should be ensured in order to encourage women for optimum breastfeeding. The other stakeholders can be involved, such as:
    - The private organizations like Bangladesh Breastfeeding Society or representative from civil society can be involved in workplace breastfeeding committee thus building an ownership.
    - Ministry of Women Affairs should also be involved to have a close look for ensuring the proper maintenance of the female workers right and prevent discrimination and harassment.

2.Recommendation for Life skill Training and Physical activity in School:

- For the Policy maker and MOF and other stakeholders:
    - MoH and MoE should develop the LST curriculum and content where healthy diet, substance abuse, contraceptives, reproductive skill and physical activity curriculum should be included. MoF and other international donors can be sought for adequate funding.

- <u>For MoYS, School authority, Local sports Office:</u>

  - Policy in light of evidences where Ministry of youth and sports can facilitate proper environment such as health education lectures, physical activity classes, arrangement of inter school sports program at regular interval among different grades of students.

3.Recommendation for safe and healthy food:

- <u>For the Policy makers:</u>
  - Review the policies about fast food marketing targeting adolescents and ensuring healthy food (Mid day meal/ iron supplementation) in school canteens or cafeterias.

- <u>For school authority, local food office:</u>
  - To ensure healthy food, school canteens /cafeterias should be taken under restriction of fast food and beverages and making access difficult to students by placing the other vendors out of school premises with the help of local food office.

4.For addressing tobacco using among rural women and SHS:

- <u>For Policy makers:</u>

  - MPOWER which is already in process should be enhanced to make indoor free smoking as done by Turkey to address the women and children to prevent active smoking and SHS.

- <u>For social organization and NGOs:</u>

  - Community based tobacco cessation program can be introduced rather than only educating people.

5.For existing care and care of risk factors:

- <u>For Policy makers:</u>

- MoH should take appropriate initiative for regular assessment of the training need of the health workers of PHC centres for the capacity building of screening and counselling of the patients with diagnosing kits.

➢ For the service providers:

- Regular counselling/screening to the patients who come to seek the treatment in the PHC for the risk factors and a consolidated and discounted package can be introduced for the risky groups in the community.

References:

1. DGHS, NCDC Unit, Ministry of Health and Family Welfare. Strategic Plan for Surveillance and Prevention of Non-communicable Diseases in Bangladesh 2011-2015. World Heal Organ [Internet]. 2011; Available from: http://www.searo.who.int/bangladesh/publications/strategic_plan_2011-15.pdf?ua=1

2. WB. World Development Indicator 2015; [Internet] cited aug3 2016Available from: http://databank.worldbank.org/data/reports.aspx?source=2&country=BGD

3. Islam A, Biswas T. Chronic non-communicable diseases and the healthcare system in Bangladesh: current status and way forward. Chronic Dis Int. 2014;1(2):1–6.

4. Joshi R, Alim M, Kengne AP, Jan S, Maulik PK, Peiris D, et al. Task shifting for non-communicable disease management in low and middle income countries - A systematic review. PLoS One. 2014;9(8).

5. Sharma K. Burden of non communicable diseases in India: Setting priority for action. Int J Med Sci Public Heal. 2013;2(1):7.

6. WHO SA region. Noncommunicable Diseases in the South-East Asia Region [Internet]. 2011. 104 p. Available from: http://www.searo.who.int/entity/noncommunicable_diseases/documents/9789290224136/en/

7. WHO. Bangladesh:WHO statistical profile. 2015; Available from: (http://who.int/gho/mortality_burden_disease/en/)

8. Bleich SN, Koehlmoos TLP, Rashid M, Peters DH, Anderson G. Noncommunicable chronic disease in Bangladesh: Overview of existing programs and priorities going forward. Health Policy [Internet]. 2011 May 23;100(2-3):282–9. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3043199/

9. Goetzel RZ, Shechter D, Ozminkowski RJ, Stapleton DC, Lapin PJ, McGinnis JM, et al. Can health promotion programs save Medicare money? Clin Interv Aging. 2007;2(1):117–22.

10. Asia Pacific Observatory on Health Systems and Policies. Bangladesh Health System Review. Health Syst Transit. 2015;5(3):214.

11. Worldatlas. Map. 2016; Available from: http://www.worldatlas.com/webimage/countrys/asia/bd.htm

12. The World Bank. NCDs Policy Brief - Bangladesh. World Health.

2011;(February):1–4.

13. MOH, Health facility Survey. Bangladesh. 2014;

14. UNDP. Bangladesh l Human Development Reports. 2015;1–7. Available from: http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/MEX.pdf

15. UN. Bangladesh. 2016; Available from: http://data.un.org/CountryProfile.aspx?crName=Bangladesh

16. (NIPORT) National Institute of Population and Research and T, Associates M and, Macro O. Bangladesh Demographic and Health Survey 2014. Popul (English Ed [Internet]. 2015; Available from: http://www.measuredhs.com/pubs/pdf/FR165/FR-BD14[FR165].pdf

17. ICDDRB. Non-Communicable Diseases in Bangladesh. Vol. 2, Evidence to Policy Series Brief. 2010. 1-2 p.

18. MOH USAIDTracking Urban Health Expenditures —. 2015;(May).

19. Darkwa EK, Newman MS, Kawkab M, Chowdhury ME. A qualitative study of factors influencing retention of doctors and nurses at rural healthcare facilities in Bangladesh. BMC Health Serv Res [Internet]. BMC Health Services Research; 2015;15(1):1–12. Available from: 10.1186/s12913-015-1012-z\nhttp://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=109244367&site=ehost-live

20. Ahmed SM, Hossain MA, Rajachowdhury AM, Bhuiya AU. The health workforce crisis in Bangladesh: shortage, inappropriate skill-mix and inequitable distribution. Hum Resour Health [Internet]. BioMed Central Ltd; 2011;9(1):3. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3037300&tool=pmcentrez&rendertype=abstract

21. World Health Organization. Bangladesh. 2014;2014. Available from: http://www.who.int/nmh/countries/bgd_en.pdf

22. Imdad A, Yakoob MY, Bhutta ZA. Impact of maternal education about complementary feeding and provision of complementary foods on child growth in developing countries. BMC Public Health [Internet]. BioMed Central Ltd; 2011;11 Suppl 3(3):S25. Available from: http://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-11-S3-S25

23. Directorate General of Health Services Ministry of Health and Family Welfare. Non-communicable disease risk factor survey Bangladesh 2010 [Internet]. World Health Organization – Country Office for

Bangladesh. 2011. Available from: http://www.searo.who.int/entity/noncommunicable_diseases/data/Bangladesh_2010_STEPS_Survey_Report.pdf

24. Bulbul T, Hoque M. Prevalence of childhood obesity and overweight in Bangladesh: findings from a countrywide epidemiological study. BMC Pediatr [Internet]. BMC Pediatrics; 2014;14(1):86. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3974229&tool=pmcentrez&rendertype=abstract\nhttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3974229{\&}tool=pmcentrez{\&}rendertype=abstract

25. Koehlmoos TLP, Engelgau MM, El-Saharty S, Ahsan KZ. Tackling noncommunicable diseases in Bangladesh : now is the time [Internet]. 2013. 1-140 p. Available from: http://documents.worldbank.org/curated/en/2013/08/18165169/tackling-noncommunicable-diseases-bangladesh-now-time

26. Koehlmoos T, Brouwer E, Analyst HE, Priorities DC, Craviotо A, Epidemiologist S, et al. Controlling the burden of.

27. On AF, Interventions E. The Early Life-Course Approach to Non-Communicable Diseases in the Post-2015 Sustainable Development Goal Context Adopting A Life-Course Approach to NCDs in the Post-2015 Era Eleven Early Life-Course Intervention Targets. 2015;

28. Child NCD. A life-course approach to NCDs : Early interventions. 2014;89–93.

29. WHO, Action Plan for The Prevention and Control of Noncommunicable Diseases in South-East Asia, 2013–2020. 2013;2013–20.

30. UNICEF. Programming Guide Infant and Young Child Feeding. Nutr Sect UNICEF. 2011;(May):173.

31. Faruque ASG, Ahmed AMS, Tahmeed A, Islam MM, Hossain MI, Roy SK, et al. Nutrition: basis for healthy children and mothers in Bangladesh. (Special issue on Achieving the Millennium Development Goals in Bangladesh). J Heal Popul Nutr [Internet]. 2008;26(3):325–39. Available from: http://www.icddrb.org

32. Poskitt EME, Breda J. Complementary feeding and non communicable diseases: Current knowledge and future research needs. Nutr Metab Cardiovasc Dis [Internet]. Elsevier Ltd; 2012;22(10):819–22. Available from: http://dx.doi.org/10.1016/j.numecd.2012.08.005

33. The NCD Alliance. Sustaining Human Development: Leveraging Early Life Opportunities to Prevent and Control NCDs. 2015;

34. Binns C, Lee M, Low WY. The Long-Term Public Health Benefits of Breastfeeding. Asia-Pacific J Public Heal [Internet]. 2016;28(1):7–14. Available from: http://aph.sagepub.com/cgi/doi/10.1177/1010539515624964

35. Yang Z, Huffman SL. Nutrition in pregnancy and early childhood and associations with obesity in developing countries. Matern Child Nutr. 2013;9(SUPPL. 1):105–19.

36. Roberts TJ, Carnahan E, Gakidou E. Can breastfeeding promote child health equity? A comprehensive analysis of breastfeeding patterns across the developing world and what we can learn from them. BMC Med [Internet]. 2013;11:254. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3896843&tool=pmcentrez&rendertype=abstract

37. (NIPORT) National Institute of Population and Research and T, Associates M and, Macro O. Bangladesh Demographic and Health Survey 2011. Bangladesh, 2012

38. (NIPORT) NI of PR and T, Associates M and, Macro O. Bangladesh Demographic and Health Survey 2004. Bangladesh. 2005;

39. UNICEF. Improving Exclusive Breastfeeding Practices by using Communication for Development in Infant and Young Child Feeding Programmes. 2011;(June 2010):1–41. Available from: http://www.cmamforum.org/Pool/Resources/C4D-in-EBF-manual-UNICEF-2010.pdf

40. Rahman RI, Islam R. Female labour force participation in Bangladesh : trends, drivers and barriers. ILO Work Pap [Internet]. 2013; Available from: http://ideas.repec.org/p/ilo/ilowps/483489.html

41. Mangasaryan N, Martin L, Brownlee A, Ogunlade A, Rudert C, Cai X. Breastfeeding promotion, support and protection: Review of six country programmes. Nutrients. 2012;4(8):990–1014.

42. Z.Fatema. Significance of Maternity benefits : Bangladesh perspectives . 2016;21(5):1–7. OSR Journal Of Humanities And Social Science (IOSR-JHSS) Volume 21, Issue 5, Ver. 1(May. 2016) PP 01-07e-ISSN: 2279-0837, p-ISSN: 2279-0845.

43. Eminence and Bangladesh Civil Society Network for Promoting Nutrition(BCSNPN) Breastfeeding, a smart choise for working women Dhaka., Bangladesh

44. Report P. Bangladesh Demographic and Health Survey Preliminary Report. 2011;

45. Kabir A, Roy S, Khatoon S. Development of a complementary feeding manual for Bangladesh. Final Res Results [Internet]. 2013; Available from: http://www.nfpcsp.org/agridrupal/sites/default/files/ToR 14 Full Report.pdf

46. H.H. V, a. K. Poverty, malnutrition, underdevelopment and cardiovascular disease: A South African perspective. Cardiovasc J Afr [Internet]. 2007;18(5):321–4. Available from: http://www.scopus.com/inward/record.url?eid=2-s2.0-40949114558&partnerID=40&md5=025efe73f5f307c0a6a9c0b415affdb7

47. Kumar KMP, Azad K, Zabeen B, Kalra S. Type 1 diabetes in children: Fighting for a place under the sun. Indian J Endocrinol Metab [Internet]. 2012;16 Suppl 1:S1–3. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3354924&tool=pmcentrez&rendertype=abstract

48. (NIPORT) National Institute of Population and Research and T, Associates M and, Macro O. Bangladesh Demographic and Health Survey , Key Indicators, 2014 Bangladesh, 2015 Indicators K. Bangladesh. 2014;

49. Kathyrn Dewey. Guiding Principles for C O M P L E M E N Ta Ry Feeding of the Breastfed Pa N a M E R I C a N H E a Lt H O R G a N I Z At I O N. J Clin Nutr Clin Nutr. 2001;18–25.

50. Saleh F, Ara F, Hoque MA, Alam MS. Complementary Feeding Practices among Mothers in Selected Slums of Dhaka City: A Descriptive Study. J Health Popul Nutr [Internet]. International Centre for Diarrhoeal Disease Research, Bangladesh; 2014 Mar;32(1):89–96. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4089076/

51. Piwoz EG, Huffman SL, Quinn VJ. Promotion and advocacy for improved complementary feeding: Can we apply the lessons learned from breastfeeding? Food and Nutrition Bulleitin [internet]. 2003 [cited on 2016 Aug 21]; 24(1):29–44. Available from: http://www.ncbi.nlm.nih.gov/pubmed/12664526

52. Ministry of Health anf Family welfare. National Strategy for Infant and Young Child Feeding in Bangladesh. 2007. Dhaka, Bangladesh: Ministry of Health and Family Wlefare; 2007, Apr.

53. AstraZeneca Youth Health Programme. Non-Communicable Diseases and Adolescents: An opportunity for action. USA: 2008;1–20.

54. Proimos J, Klein JD. Noncommunicable Diseases in Children and Adolescents. Pediatrics [Internet]. 2012 [cited on 2016 aug 22]

;130(3):379–81. Available from: http://pediatrics.aappublications.org/cgi/doi/10.1542/peds.2012-1475

55. U.S Departent of health and human services, Office of minority health. National Standards for Culturally and Linguistically Appropriate Services in Health Care. Washington D.C:Office of minority health;2001.

56. Goodman A, Joshi H, Nasim B, Tyler C. Social and emotional skills in childhood and their long-term effects on adult life. 2015 Mar:

57. Blueprint for violence prevention lifeskills training program. LifeSkills Training Program and Positive Educational Outcomes.

58. Skar M, Kirstein E, Kapur A. Lessons learnt from school-based health promotion projects in low- and middle-income countries. Child Care Health Dev [Internet]. Wiley Online Library; 2015;41(6):1114–23. Available from: http://dx.doi.org/10.1111/cch.12231

59. Botvin GJ. Preventing Adolescent Drug Abuse through Life skill training:Theory, evidence and effectiveness, and inplementation issue. cornell University Medical college: USA;1995;39–50.

60. Song Y, Zhao L, Palipudi KM, Asma S, Morton J, Talley B, et al. Tracking MPOWER in 14 countries: results from the Global Adult Tobacco Survey, 2008-2010. Glob Health Promot. 2013;23. doi: 10.1177/1757975913501911.

61. Ministry of Planning. Government of peoples republic o Bangladesh. BBS. Health and Morbidity survey Status 2012. Bangladesh: Ministry of planing; 2013.

62. Shazzad Md N, Abdal SJ, Majumder MSM, Sohel JA, Ali SMM, Ahmed S. Drug Addiction in Bangladesh and its Effect. Medicine Today.2013;25(02):84–9. DOI: http://dx.doi.org/10.3329

63. Bull FC, Bauman AE. Physical inactivity: the “Cinderella” risk factor for noncommunicable disease prevention. Jornal of Helath communication. 2011;(2):13–26. doi: 10.1080/10810730.2011.601226.

64. Weiss R, Caprio S. The metabolic consequences of childhood obesity. Best Pract Res Clin Endocrinol Metab. 2016 Jul 23;19(3):405–19. doi.org/10.1016/j.beem.2005.04.009

65. Rahman S, Islam MT, Alam DS. Obesity and overweight in Bangladeshi children and adolescents: a scoping review. BMC Public Health [Internet]. 2014;14(1):70. DOI:10.1016/j.beem.2005.04.009

66. Lachat C, Otchere S, Roberfroid D, Abdulai A, Seret FMA, Milesevic J, et al. Diet and Physical Activity for the Prevention of Noncommunicable

Diseases in Low- and Middle-Income Countries: A Systematic Policy Review. PLoS Med. 2013;10(6). doi: 10.1371/journal.pmed.1001465.

67. Khan SH, Talukder SH. Nutrition transition in Bangladesh: Is the country ready for this double burden. Obes Rev. 2013;14(S2):126–33. doi: 10.1111/obr.12100

68. Floriani V, Kennedy C. Promotion of physical activity in children. Curr Opin Pediatr]. 2008;20(1). doi: 10.1097/MOP.0b013e3282f3d9f9

69. Centre for disease control and prevention.School playground : Its impact on children ' s learning and development. USA: CDC;2016.

70. Bauman A, Schoeppe S, Lewicka M, Armstrong T, Canadeias V, Richards J. Review of Best Practice in Interventions to Promote Physical Activity in Developing Countries. WHO Work Phys Act Public Heal. 2005;(October):1–118.

71. Needed WIS. a commitment TO : NCD Alliance Briefing Paper Nutrition , Physical Activity and NCD Prevention. 2016;

72. Akhter N, Sondhya FY. Nutritional status of adolescents in Bangladesh: Comparison of severe thinness status of a low–income family's adolescents between urban and rural Bangladesh. Vol. 2, Journal of Education and Health Promotion. India; 2013.

73. Ahmed AU. Impact of feeding children in school: Evidence from Bangladesh. Int Food Policy Res Inst [Internet]. 2004;2033:20006–1002. Available from: http://www.lcgbangladesh.org/FSN/reports/IFPRI Final Report_School Feeding in Bangladesh.pdf

74. Alam N, Roy SK, Ahmed T, Ahmed AMS. Nutritional status, dietary intake, and relevant knowledge of adolescent girls in rural Bangladesh. J Heal Popul Nutr. 2010;28(1):86–94.

75. Taylor AL, Dhillon IS, Hwenda L. A WHO / UNICEF Global Code of Practice on the Marketing of Unhealthy Food and Beverages to Children.

76. Das JC. Fast Food Consumption in Children: A Review. Med Clin Rev [Internet]. 2015;1(1:1):1–4. Available from: http://medical-clinical-reviews.imedpub.com/abstract/fast-food-consumption-in-children-a-review-0.html

77. WHO. Set Of Recommendations On The Marketing Of Foods And Non-Alcoholoic Beverages To Childern. World Heal Organ [Internet]. 2010;1–16. Available from: http://apps.who.int/iris/bitstream/10665/44416/1/9789241500210_en

g.pdf

78. A. Noman Mohammad Atahar. Ali, and Food safety and public health issues in Bangladesh: a regulatory (2013) 8 (1) European Food and Feed Law Review 31–40.

79. Advertising of Unhealthy Foods in Bangladesh : The Current Situation and Suggestions for Action. Available from: http://www.wbbtrust.org/clock_uploads/files/junk%20food%20ad%20report%20Engl%20final.pdf

80. Miller J, Rosso D. Programs : Improving effectiveness and increasing the benefit to education . Child Dev. 1999;44(0):1–45.

81. Hamid Y, Hamid A. Mid-Day Meal Scheme and Growth of Primary Education : A Case Study of District Anantnag in Jammu and Kashmir. Bangladesh e-Journal Sociol. 2012;9(1):80–9.

82. National Food Policy Ministry of Food and Disaster Management. Bangladesh.Food Policy. 2006;

83. Nahar Q, Choudhury S, Faruque MO, Mannan MA. Dietary Guidelines for Bangladesh. 2013.

84. The NCD Alliance. A Focus on Children and Diseases (NCDs). Prevention. 2011;3(September):1–20.

85. MOH, Act S. Global Adult Tobacco Survey: Bangladesh Report 2009. Regulation. 2010;36(7):410–776.

86. Tobergte DR, Curtis S. No Title No Title. Vol. 53, Journal of Chemical Information and Modeling. 2013. 1689-1699 p.

87. Bangladesh National Parliament. Bangladesh Gazzette. Bangladesh. 2013;(D):2811–8.

88. World Health Organization. 65th World Health Assembly. Prevention and control of non-communicable diseases. Resolut Decis [Internet]. 2012;(May):45–6. Available from: http://apps.who.int/gb/ebwha/pdf_files/WHA65-REC1/A65_REC1-en.pdf#page=65

89. Kabir MA, Goh K-L, Kamal SMM, Khan MMH. Tobacco smoking and its association with illicit drug use among young men aged 15-24 years living in urban slums of Bangladesh. PLoS One [Internet]. 2013;8(7):e68728. Available from: http://www.scopus.com/inward/record.url?eid=2-s2.0-84880806328&partnerID=tZOtx3y1

90. Pasternak Y, Aviram A. Maternal nutrition and offspring's adulthood

NCD's: a review. J Matern Neonatal Med [Internet]. 2013;26(July 2016):439–44. Available from: http://informahealthcare.com/doi/abs/10.3109/14767058.2012.745505

91. Health W, Regional O. Good Maternal Nutrition The best start in life.

92. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet [Internet]. Elsevier; 2016 Jul 15;382(9890):427–51. Available from: http://dx.doi.org/10.1016/S0140-6736(13)60937-X

93. Black RE, Hopkins Bloomberg J. The Lancet ' s Series on Maternal and Child Undernutrition: Executive Summary. Lancetancet. 2008;1–10.

94. Cedergren MI. Maternal morbid obesity and the risk of adverse pregnancy outcome. Obstet Gynecol [Internet]. 2004;103(2):219–24. Available from: http://journals.lww.com/greenjournal/Abstract/2004/02000/Maternal_Morbid_Obesity_and_the_Risk_of_Adverse.2.aspx?trendmd-shared=0

95. NCD Alliance. Communicable Diseases: A Priority for Women's Health and Development. 2011;1–20.

96. UNICEF. Child and Maternal Nutrition in Bangladesh. 2007;1–5. adapted April 2009

97. The World Bank, Bank TW. The Bangladesh Integrated Nutrition Project: Effectiveness and Lessons. World. 2005;106.

98. Sayem AM, Nury ATM. Factors associated with teenage marital pregnancy among Bangladeshi women. Reprod Health. 2011;8(1):16.

99. Programme WF. WFP Bangladesh Nutrition Strategy 2012-2016. 2012; Available from: https://www.wfp.org/sites/default/files/Nutrition Strategy_Final_high res_5.pdf

100. Kheirouri S, Alizadeh M. Process evaluation of a national school-based iron supplementation program for adolescent girls in Iran. BMC Public Health. 2014;14:959.

101. Ruebeck H. Implementation and Effects of India ' s National School-Based Iron Supplementation Program. 2016;

102. Deshmukh PR, Garg BS, Bharambe MS. Effectiveness of weekly supplementation of iron to control anaemia among adolescent girls of Nashik, Maharashtra, India. J Heal Popul Nutr. 2008;26(1):74–8.

103. WHO. WHO-GINA. 2012; Available from:

https://extranet.who.int/nutrition/gina/en/programmes/1386

104. World. Global status report on noncommunicable diseases. 2010; Available from: http://www.who.int/nmh/publications/ncd_report2010/en/

105. Abdullah AS, Husten CG. Promotion of smoking cessation in developing countries: a framework for urgent public health interventions. Thorax. 2004;59:623–30.

106. Jemal A, Center MM, DeSantis C, Ward EM. Global patterns of cancer incidence and mortality rates and trends. Cancer Epidemiol biomarkers Prev [Internet]. 2010;19(8):1893–907. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20647400

107. Nargis N, Thompson ME, Fong GT, Driezen P, Hussain AKMG, Ruthbah UH, et al. Prevalence and patterns of tobacco use in Bangladesh from 2009 to 2012: Evidence from International Tobacco Control (ITC) study. PLoS One. 2015;10(11):1–16.

108. World Health Organization. WHO global report on trends in prevalence of tobacco smoking 2015. WHO Mag [Internet]. 2015;359. Available from: http://apps.who.int/iris/bitstream/10665/156262/1/9789241564922_eng.pdf?ua=1

109. Zaman MM, Bhuiyan MR, Karim MN, MoniruzZaman, Rahman MM, Akanda AW, et al. Clustering of non-communicable diseases risk factors in Bangladeshi adults: An analysis of STEPS survey 2013. BMC Public Health [Internet]. BMC Public Health; 2015;15:659. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4501055&tool=pmcentrez&rendertype=abstract

110. Palipudi K, Sinha D, Choudhury S, Mustafa Z, Andes L, Asma S. Exposure to tobacco smoke among adults in Bangladesh. Indian J Public Health [Internet]. 2011 Jul 1;55(3):210–9. Available from: http://www.ijph.in/article.asp?issn=0019-557X

111. Efroymson D, Ahmed S. Building Momentum for Tobacco Control : The Case of Bangladesh. 1999;13–37.

112. Begum, M.E.A., Hossain, M.I., D'Haese L. Food security in Bangladesh: Present status and trend. Progress Agric [Internet]. 2013;24(1-2):263–71. Available from: http://www.banglajol.info/bd/index.php/PA/article/view/19178/13312

113. World Cancer Research Fund & The NCD Alliance. The link between food , nutrition , diet and non-communicable diseases. 2014; Available

from:
http://www.wcrf.org/sites/default/files/PPA_NCD_Alliance_Nutrition.pdf

114. Post 2015 Global Thematic Consultation on Food and Nutrition Security. 2015; Available from: https://ncdalliance.org/sites/default/files/rfiles/Post 2015 Food and Nutrition Security_NCDA_final.pdf

115. Bose ML, Dey MM. Food and Nutritional Security in Bangladesh: Going beyond Carbohydrate Counts. Agric Econ Res Rev. 2007;20(482):203–25.

116. Perry A. Cost of the Diet - novel approach to estimate affordability of a nutritious diet. F Exch. 2013;

117. Hancock C. Review : The benefits of physical activity for health and we ll-being. 2011;(October). Available from: http://www.c3health.org/wp-content/uploads/2009/09/C3-review-of-physical-activity-and-health-v-1-20110603.pdf

118. Moniruzzaman M, Mostafa Zaman M, Islalm MS, Ahasan HAMN, Kabir H, Yasmin R. Physical activity levels in Bangladeshi adults: Results from STEPS survey 2010. Public Health [Internet]. Elsevier Ltd; 2015;4–11. Available from: http://dx.doi.org/10.1016/j.puhe.2016.02.028

119. Rahman MS, Akter S, Abe SK, Islam MR, Mondal MNI, Rahman JAMS, et al. Awareness, Treatment, and Control of Diabetes in Bangladesh: A Nationwide Population-Based Study. Goldhaber-Fiebert JD, editor. PLoS One [Internet]. San Francisco, CA USA: Public Library of Science; 2015 Feb 18;10(2):e0118365. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4334658/

120. Saquib N, Saquib J, Ahmed T, Khanam MA, Cullen MR. Cardiovascular diseases and type 2 diabetes in Bangladesh: a systematic review and meta-analysis of studies between 1995 and 2010. BMC Public Health [Internet]. BMC Public Health; 2012;12(1):434. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22694854

121. McKay AJ, Laverty AA, Shridhar K, Alam D, Dias A, Williams J, et al. Associations between active travel and adiposity in rural India and Bangladesh: a cross-sectional study. BMC Public Health [Internet]. BMC Public Health; 2015;15(1):1087. Available from: http://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-015-2411-0

122. Helal uz Zaman AK., Tariqul Alam KM, Jahirul Islam M. Urbanization in Bangladesh: Present Status and Policy Implications. ASA Univ Rev.

2010;4(2).

123. Laumbach RJ, Kipen HM. Acute effects of motor vehicle traffic-related air pollution exposures on measures of oxidative stress in human airways. Ann N Y Acad Sci. 2010;1203:107–12.

124. Sayeed MA, Mahtab H, Khanam PA, Latif ZA, Ali SMK, Banu A, et al. Diabetes and impaired fasting glycemia in a rural population of Bangladesh. Diabetes Care. 2003;26(4):1034–9.

125. Bradshaw S, Fordham M. Women and girls in disasters. 2013;1–10.

126. World Health Organization. Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases The six objectives of the 2008-2013. Geneva World Heal Organ [Internet]. 2008;(1):48. Available from: http://whqlibdoc.who.int/publications/2009/9789241597418_eng.pdf

127. Nugent R. Benefits and Costs of the Non-communicable Diseases Targets for the post-2015 Development Agenda. 2015; Available from: http://www.copenhagenconsensus.com/sites/default/files/health_perspective_ncd_-_nugent.pdf

128. Manuscript A. Existing Programs and Priorities Going Forward. 2012;100:282–9.

129. Mahmood SAI, Ali S, Islam R. Shifting from infectious diseases to non-communicable diseases: A double burden of diseases in Bangladesh. J Public Heal Epidemiol [Internet]. 2013;5(11):424–34. Available from: http://academicjournals.org/journal/JPHE/article-abstract/67582D040446

130. Akter S, Rahman MM, Abe SK, Sultana P. Prevalence of diabetes and prediabetes and their risk factors among Bangladeshi adults: a nationwide survey. Bull World Health Organ [Internet]. 2014;92(3):204–13A. Available from: http://www.scielosp.org/scielo.php?script=sci_arttext&pid=S0042-96862014000300204&lng=en&nrm=iso&tlng=es

131. Imam T. Diabetic Prevalence in Bangladesh : The Role of Some Associated Demographic and Socio- economic Characteristics . nternational Journal of Advancements in Research & Technology, Volume 1, Issue 7, December-2012;1(7):61–70.

132. Montserrat Meiro-Lorenzo, Tonya L. Villafana, Margaret N. Harrit Effective Responses To Non-Communicable. 2011 Sep. Avauilable From: http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATIO

N/Resources/281627-1095698140167/EffectiveResponsestoNCDs.pdf

133. Dodgson, J., Chee, Y., & Yap T. Workplace breastfeeding support for hospital 10.1111/j.1365-2648.2004.03070.x employees.: EBSCOhost. Blackwell Publ Ltd, [Internet]. 2003;47(1):91–100.

134. Chen YC, Wu Y-C, Chie W-C. Effects of work-related factors on the breastfeeding behavior of working mothers in a Taiwanese semiconductor manufacturer: a cross-sectional survey. BMC Public Health. 2006;6(October):160.

135. Breastfeeding and work snapshots from companies around the world - UNICEF Connect.

136. Vlismas K, Stavrinos V, Panagiotakos DB. Socio-economic status, dietary habits and health-related outcomes in various parts of the world: A review. Cent Eur J Public Health. 2009;17(2):55–63.

137. Sunguya BF, Poudel KC, Mlunde LB, Shakya P, Urassa DP, Jimba M, et al. Effectiveness of nutrition training of health workers toward improving caregivers' feeding practices for children aged six months to two years: a systematic review. Nutr J [Internet]. 2013;12(1):66. Available from:

138. Faber M, Benade S. breastfeeding, complementary feeding and nutritional status of 6-12 month old infants in rulal KwaZulu-Natal. Sajcn. 2007;20(1):16–24.

139. Project S. Evidence of Effective Approaches to Social and Behabiour Change Communication for preventing and Reducing Stunting and Anemia. Syst Lit Rev. 2014;(August):116.

140. Srikala B, Kishore KK V. Empowering adolescents with life skills education in schools – School mental health program: Does it work? Indian J Psychiatry [Internet]. India: Medknow Publications; 2010;52(4):344–9. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3025161/

141. Haque SE, Rahman M, Itsuko K, Mutahara M, Kayako S, Tsutsumi A, et al. Effect of a school-based oral health education in preventing untreated dental caries and increasing knowledge, attitude, and practices among adolescents in Bangladesh. BMC Oral Health [Internet]. BMC Oral Health; 2016;16(1):10. Available from: http://bmcoralhealth.biomedcentral.com/articles/10.1186/s12903-016-0202-3

142. Law BMF, Lee TY. Importance of Emotional Competence in Designing

an Antidrug Education Curriculum for Junior Secondary School Students in Hong Kong. Sci World J [Internet]. 2011;11:2257–65. Available from: http://www.hindawi.com/journals/tswj/2011/127894/

143. Spencer AP. Diversifying school meals with local production " Local procurement " in Cabo Verde. 2015;(May):2014–5.

144. Minj C, Goud BR, James DE, Furruqh F, Mohammad A. Impact of School Mid Day Meal Program on the Nutritional status of Children in a rural area of South Karnataka , India Methodology Result and Discussion. Int J Curr Res Acad Rev. 2014;2(8):78–84.

145. Kelly B, Halford JCG, Boyland EJ, Chapman K, Bautista-Castaño I, Berg C, et al. Television food advertising to children: A global perspective. Am J Public Health. 2010;100(9):1730–6.

146. Story M, French S. Food Advertising and Marketing Directed at Children and Adolescents in the US. Int J Behav Nutr Phys Act. 2004;1:3.

147. Agarwal KN1, Gomber S, Bisht H SM. Anemia prophylaxis in adolescent school girls by weekly or daily iron-folate supplementation. Indian Pediatr. 2003;40(4)(April):296–301.

148. Horjus P1, Aguayo VM, Roley JA, Pene MC MS. School-based iron and folic acid supplementation for adolescent girls: findings from Manica Province, Mozambique. Food Nutr Bull. 2005;Sep;(26(3):):281–6.

149. Mishra G, Kulkarni S, Majmudar P, Gupta S, Shastri S. Community-based tobacco cessation program among women in Mumbai, India. Indian J Cancer [Internet]. 2014 Dec 1;51(5):54–9. Available from: http://www.indianjcancer.com/article.asp?issn=0019-509X

150. World Health Orgnisation. MPOWER in Action. 2013; Available from: http://www.who.int/tobacco/mpower/publications/mpower_2013.pdf?ua=1

151. World Bank. Leading by Example: Combating Non-Communicable Diseases in Sri Lanka through Health Promotion and Prevention 2015; Available from: http://www.worldbank.org/en/news/feature/2015/04/02/combating-non-communicable-diseases-health-promotion-prevention

152. National Communication Strategy and Action Plan for Reduction of NCD High Risk Behaviors in Bangladesh , 2014-2016. 2016;2014–6.