BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-029562
Article Type:	Research
Date Submitted by the Author:	31-Jan-2019
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Keywords:	PUBLIC HEALTH, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

Non-communicable disease (NCD) corners in public sector health facilities in Bangladesh: Challenges and opportunities for improving NCD services at primary health care level

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Running title: NCD corners in Bangladesh …

Abstract

Objective: To explore health care providers' perspective on non-communicable disease (NCD) prevention and management services being provided by the NCD corners in Bangladesh and also to determine challenges and opportunities in strengthening those NCD services at primary health care level.

Design: We used a qualitative narrative inquiry design, where we conducted qualitative in-depth interviews with health care providers. Also, we developed and used health facility observation check-list to assess the NCD service readiness. Further, a stakeholder meeting with participants from different sectors (government, NGOs, private sector, universities, and health media) was conducted.

Setting: Altogether 12 sub-district health facilities, called as upazila health complex (UHC) across four administrative divisions of Bangladesh.

Participants: The participants included upazila health and family planning officers (n=4), resident medical officers (n=6), medical doctors (n=4) and civil surgeon (n=1).

Results: Three major themes emerged from the data: (a) awareness of the NCD burden, (b) knowledge of government NCD initiatives, and (c) challenges associated with NCD corners. Participants reported that diabetes, hypertension and chronic obstructive pulmonary disease were the major NCDs related problems. They also acknowledged that the governments' initiative to establish and scale-up NCD corners was timely and an important step to curb the threat posed by NCDs. However, they highlighted

some important challenges including the lack of specific guidelines and standard operating procedure to guide service providers' decision making; lack of trained human resources; inadequate physical and laboratory facilities; poor supply of logistics and NCD medicines; poor recording and reporting of services; and inadequate communication with the NCD control unit of DG health services.

Conclusion: Apparently, the NCD corners are still not fully capacitated to screen for possible NCDs including subsequent investigation, referral and maintain sustainable treatment regime. These need to be taken into consideration before attempting to expand these NCD corners in other UHCs.

Strengths and limitations of the study:

- In order to address the growing burden of non-communicable diseases (NCDs), the Government of Bangladesh, in recent years, has taken initiatives to establishing the NCD corners at sub-district level health facilities. To the best of our knowledge, this is the first study ever been conducted to assess the current situation of the NCD corners and examined challenges and opportunities to strengthening NCD services.
- We have identified many important challenges to implementation of NCD corners, which include (i) no existence of specific guidelines and standard operating procedure; (ii) lack of trained human resources; (iii) inadequate physical and laboratory facilities and (iv) poor recording and reporting systems.
- We have also identified possible opportunities to strengthening NCD services, which include (i) Government's commitment to NCD prevention and control; (ii) setting up NCD corners at sub-district level; (iii) allocation of health care staff for NCD corner; and (iv) resources (finance, logistics/ drugs) allocation and supplies etc.
- **One of the key limitations of this study is, w**e were unable to include beyond 12 NCD corners of 12 selected sub-districts across four administrative divisions. This was due to time and resource constraints. Having additional sub-districts included in this study could have added diverse insights. Also, this study lacked collecting data from the patients, which could also have added further insights from the service recipients' perspective.
- The NCD corners are still at a nascent stage, therefore the capacity of the NCD corners to screen for NCDs and subsequent systems for investigation, medication, referral, recording & reporting and follow-up needs improvement, prior to expanding these NCD corners to other sub-district level health facilities in the country.

Introduction

Like other low and middle-income countries (LMICs), Bangladesh is experiencing rapid demographic and epidemiological transitions[1-3], and subsequent rise in ageing population and the burden of non-communicable diseases (NCDs).[2-4] The Global Burden of Disease study estimated that the proportion of deaths due to NCDs in Bangladesh increased from 43.4% in 2000 to 66.9% in 2015[5], and this poses a major challenge for the Bangladesh's existing health care systems, which are mainly geared towards addressing communicable diseases.[6 7] The impact of NCDs on national economy, communities, families and individuals is unbearable[8-10] and this is likely to be more serious in coming years, as the

number of people with risk for developing NCDs increases.[11-14] Recent studies have shown that the NCD risk factors including overweight, underweight, hypertension, dyslipidemia, physical inactivity, tobacco smoking and low consumption of vegetables were common among adults living in urban[12-14] as well as rural areas[12] and across the adults of all economic quintiles.[9]

In recent years, the government of Bangladesh has taken initiatives to combat NCDs at system, institutional and service delivery levels. National NCD plan has been developed; a dedicated NCD control unit housed within the Directorate General of Health Services, within the Ministry of Health and Family Welfare, has been established in 2011. Since 2012, it initiated NCD corner in upazila (sub-district) health complexes (UHCs) for addressing NCDs. These NCD corners are dedicated centres whose aim is to provide prevention and care services for NCDs and related conditions such as CVDs, diabetes, and chronic respiratory diseases (asthma and COPD) and screening for certain cancers.[6]

Though the national guidelines for NCDs surveillance has been developed, the implementation of the guideline's provisions and services has remained weak.[7] At the union and upozila levels, where the doctors are posted, NCD prevention and management services are not systematically offered.[15] It is praiseworthy that the government plans to scale-up NCD corners, however, to date no robust information is available to explain the current situation of these NCD corners. It is very important to know how these NCD corners are functioning, what are the barriers and gaps along the implementation process, and how the services could be strengthened. The aim of this study was to assess the services provided by NCD corners and to determine the challenges and opportunities for strengthening NCD services provided by the NCD corners in Bangladesh.

Methods

Setting: Bangladesh currently has seven administrative divisions, which are divided into 65 districts, called as Zila, and 493 sub-districts, called as upozila. In our study, altogether, 12 selected NCD corners located at 12 UHCs, of four administrative divisions including Dhaka, Sylhet, Khulna and Chittagong, were included in this study.

***Study design*:** We used a qualitative narrative inquiry approach[16] involving qualitative interviews with health care providers. Narrative inquiry is a way of understanding experiences of participants and also involves understanding the social and contextual aspects. Researchers have an important role to contribute to the inquiry process. Participants' awareness, and knowledge about the NCDs and initiatives to tackle NCDs and their perceptions about existing challenges in the NCD corners were explored during the interviews. In addition, we conducted a series of informal group meetings with health care providers to supplement the data collected through KIIs. Audit of NCD corners was conducted through development and use of health facility assessment check list. Finally, a stakeholder meeting was conducted where we presented preliminary findings of the study and gathered feedback, comments and suggestion. The participants of the stakeholder meeting were health care providers, government personnel, researchers, academicians, health journalists, those working in non-government sectors, and policy people from the ministry of health and family welfare Bangladesh.

Sampling strategy*:** The multi-stage sampling strategy as shown in ***Figure 1, was used. A list of UHCs and NCD corners according to the administrative divisions and the respective districts was prepared. Twelve NCD corners of four administrative divisions were selected for the convenience of data collection and representation of areas including haor (wetland area), coastal, rural and hill tract.

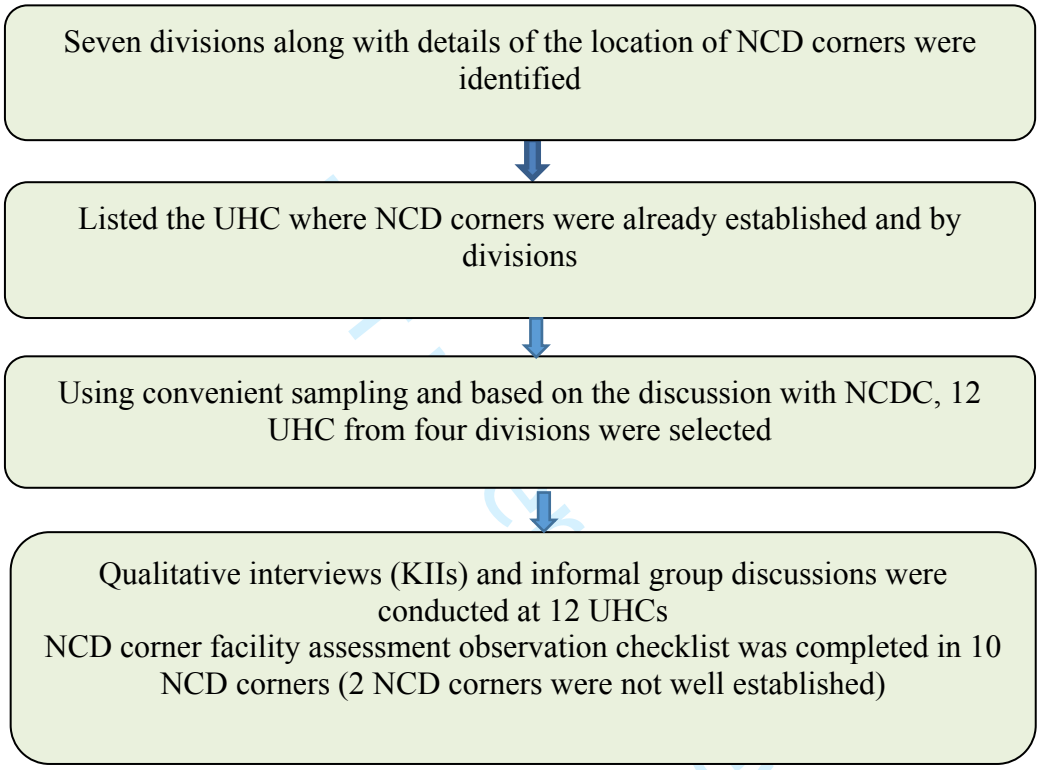

Figure 1: Flow chart describing sampling strategy and data collection process in the study

Tools development: Key Informant Interview (KII) guideline was developed and used for conducting qualitative interviews. The health facility check-list was developed based on the review of available tools, in particularly the Bangladesh health facility survey (2014)[17], list of essential drugs and supplies by DGHS, HMIS reporting format and list of NCDs drugs supplied by the DG Health Services Bangladesh.

***Ethics approval and consent to participate*:** The ethics approval of this study was obtained from the Ethics Review Committee of icddr,b, Bangladesh. Prior to interviews, the participants were fully informed about the study objectives and were explained about the use of data. Informed written consent was obtained prior to the interview and consent was also sought for tape recording of interviews.

***Data collection*:** Data were collected from 12 NCD corners of four divisions. Two UHCs (Ramu and Teknaf) of Chittagong division had not yet officially established NCD corners, therefore the health facility checklist was not used. Altogether 15 qualitative interviews were conducted. Given the language efficiency of health care providers, the interviews were conducted in English medium by the principal investigator of the study. The interviews were tape recorded. The KIIs included upazila health and family welfare officer (UH&FPO) (n=4), resident medical officer (RMO) (n=6), medical officers (MO) (n=4) and civil surgeon (n=1). The health facility checklist with major areas of (a) availability of basic infrastructure, (b) equipment and supplies, (c) laboratory facility, (d) human resources for health, (e) NCDs essential drugs and other relevant medications, was used. A series of informal group discussions were also held with the health care providers of the respective UHCs. Further, the comments/ feedback and suggestions received from the stakeholder meeting were incorporated in the study.

Data analysis: The audio recordings of the interviews were transcribed into verbatim using a professionally transcription services. Coding of the data and identification of themes from the transcripts were carried out using a thematic approach. A thematic analysis process that involves an identification of themes through careful reading and reading of transcripts related to research questions was used for the analysis. The process of coding involved an inductive approach and the common themes were identified by comparing and contrasting the patterns and meanings of the expressions among participants. The process of reading transcripts, coding and analysis of the data was undertaken independently by two researchers (LR and TB) and further checked for accuracy by another 2 members (KK and IT). All the team members reviewed the final themes and a consensus was achieved resolving the discrepancies through discussion. A final set of six major themes were identified and the findings are presented accordingly. Participants were deidentified throughout the transcription to ensure the confidentiality and anonymity of participants. Numeric pseudonyms were used to identify statements from individuals representing the 12 NCD corners sites.

Results

The findings obtained in this study show that the NCD burden is growing. The government's initiative to establish and strengthen NCD corner at UHC level to address the problem of NCD is appreciated. Participants noted several challenges including human resources recruitment and deployment, capacity building, supplies of drugs and logistics, service delivery, recording and reporting and communication and coordination etc. The findings are presented according to the following themes.

NCDs current scenario: Participants reported that the most common reasons for patients' visit to NCD corners were related to chronic conditions including diabetes, cardiovascular diseases (CVD) and Chronic Obstructive Pulmonary Disease (COPD). In addition, other listed reasons for patients' visit were related with the problems of mental health, cancers and road traffic accidents.

In most cases, the patients visited health facilities not knowing that they had developed NCDs. Participants also reported that the patients had not realised the symptoms of NCDs. The NCD patients are in generally identified while attending OPD for other conditions. One MO expressed:

"*It is somehow difficult to identify patients with NCDs as people do not usually come to treat NCDs. The patients come with general sickness and sometimes hide or even forget to mention symptoms that might help to identify NCD cases.*" *-MO, Ramu UHC, Chittagong*

NCDs service readiness (physical and human resources, equipment, logistics and drugs): Most of the NCD corners contained with the basic equipment, such as BP measurement set, weighing scale, and height measurement scale. Some of those NCD corners which had glucometers available, however the supplies such as, glucometer strips or batteries were out of stock. One MO told:

"*BP machine and glucometer set along with other measuring tools are available in our NCD corner. But the problem is we don't have enough glucose measuring strips.*" *-MO, Munshiganj, Dhaka*

In terms of human resources, participants shared their concern that there was no designated position for the MO, paramedic and nurse in NCD corners. In general, the MO and other staff were assigned locally by the health facility in-charge. One MO expressed:

"*There is no such team working here at the NCD corner. Only the NCD MO is working at the NCD corner. The senior nurse and a paramedic are involved but not dedicated to NCD corner only, they are responsible to overall OPD services.*" *-MO Devbhata, Khulna*

Logistics and drugs were supplied upon request from the Civil Surgeon's Office (district health office) on a monthly basis and also when needed in case of emergency. The NCD related drugs were supplied within the regular drug supply schedule and in most cases, drugs were not supplied on a regular basis and supply remained uncertain. One UH&FPO mentioned:

"*For the OPD patients, the type of medicines dispensed depends on the availability of medicine. We always try to provide whatever medicines are available at the dispensary, but in most cases, we have stock out of NCD drugs, so patients are advised to purchase medicines from the private drug shops.*"

-UH&FPO, Jhikorgacha, Khulna

In order to supplement information concerning NCDs service readiness, we also collected quantitative data using NCD health facility service observation check-list **(Table 1).** All NCD corners had availability of basic equipment, however some essential equipment and supplies were not available. Also, the shortage for laboratory facilities in all UHCs was reported. All UHCs had the MO and paramedics locally assigned. NCD drugs were unavailable in almost all UHCs, except few UHCs of Khulna Division and one UHC of Dhaka division had some relevant NCD drugs available.

Table 1. Service readiness (availability of basic infrastructure, equipment and supplies)

Physical infrastructure	Khulna division				Dhaka division			Sylhet division		
UHCs code ⇨	1	2	3	4	5	6	7	8	9	10
Basic infrastructure										
Adequate lighting	√	√	√	√	√	√	√	√	√	√
Water and sanitation facilities	√	√	√	√	√	√	√	√	√	√
Space, cleanliness, ventilation	√	√	√	√	√	√	√	√	√	√
Storage facility/ Refrigeration	×	×	×	×	×	×	×	×	×	×
Furniture (patient examination bed, chairs & table)	√	√	√	√	√	√	√	√	√	√
Basic equipment and supplies										
Weighting scale	√	√	√	√	√	√	√	√	√	√
Measuring tape	√	√	√	√	√	√	√	√	√	√
Height measure	√	√	√	√	√	√	√	√	√	√
Stethoscope	√	√	√	√	√	√	√	√	√	√
BP measurement set	√	√	√	√	√	√	√	√	√	√
NCD patient register book	×	×	×	×	×	×	×	×	×	×
Clinical protocol for NCDs	×	×	×	×	×	×	×	×	×	×
NCDs related IEC materials	×	×	×	×	×	×	×	×	×	×
Investigation and laboratory facilities										
Glucometer set	×	×	×	×	×	×	×	×	×	×
ECG set	×	×	×	×	×	×	×	×	×	×
Urine protein test by strips	√*	√	√	√*	√	√*	√	√*	√*	√*
Urine Ketone test by strips	√	√*	√	√	√*	√	√*	√*	√*	√
Blood Cholesterol assay	√	×	√	×	√	×	×	×	×	√
Lipid Profile	√	√	√	×	√	×	√	√	×	√
Serum Creatinine assay	√	×	√	×	×	×	√*	×	×	×
Troponin Test by strips	×	×	×	×	×	×	×	×	×	×
Urine test strips	√	×	√	×	√	×	×	×	×	×
Fasting blood sugar test	√	√*	√	√*	√*	√*	√*	√*	√*	√*
BS 2Hrs ABF	√	√*	√	×	√*	×	√*	×	√*	√*
HbA1c	×	×	×	×	×	×	×	×	×	×
Human resources										
Medical Officer	√	√	√	√	√	√	√	√	√	√
Nurse	√	√	√	√	√	√	√	√	×	√
Others suppor staff	√	√	√	√	√	×	√	×	√	×
Availability of NCDs drugs										
Metformin	√	√	×	×	√	×	×	×	×	×
Insulin	×	×	×	×	×	×	×	×	×	×
Glibenclamide	×	×	×	×	×	×	×	×	×	×
Amlodipine (Tab. Amdocal)	√	√	×	×	√	×	×	×	×	×
Tab Nifedipine	×	×	×	×	×	×	×	×	×	×
Hydrochlorothiazide	×	√	×	×	×	×	×	×	×	×
Propranolol	×	×	×	×	×	×	×	×	×	×
Atenolol	×	×	×	×	×	×	×	×	×	×
Furosemide	×	×	×	×	×	×	×	×	×	×
Spironolactone	×	×	×	×	×	×	×	×	×	×

* Reagent/ lab technician was not available during the period of data collection; √ denotes availability of services; × denotes unavailability of services

UHC codes = 1: Chowgacha UHC; 2: Zhigorgacha UHC; 3: Kaligong UHC; 4: Devhata UHC; 5: Mushigong UHC; 6: Hazigong UHC; 7: Golapgong UHC; 8: Balagong UHC; 9: Fenchugong UHC; 10: Chatok UHC

NCDs screening, diagnosis, treatment, follow-up and referral: Participants reported that the services available in the NCD corners were limited to general consultation, health education and counselling.

Patients were advised to perform necessary investigations when required. Those patients requiring further attention, were referred to the specialists such as cardiologist, endocrinologist, and pulmonologist. In most cases, the specialists were not available in the UHCs. One MO stated:

"*The patients generally receive basic NCD services including consultation, basic investigation, and treatment and advice from us. In case the case is not manageable or too serious, we refer the patients to the district hospital.*" *-UH&FPO Teknaf, Chittagong*

Another MO described about the follow-up process of patients:
"*We do not have formal system to follow-up the patients, but I always tell the patients for follow-up visit after a certain duration and also I suggest them to bring the old OPD card during the next visit." -MO, Munshiganj, Dhaka*

In contrast, the RMOs and MOs also shared that most patients with diabetes, performed their follow-up visit with their previous OPD cards. Furthermore, they also expressed their concern that there must still be a big chunk of patients who do not give importance of bringing OPD card during the follow-up visits. One KII mentioned:
"*Among the patients, who come for follow-up, the diabetes patients are very much aware and regular but the hypertension patients sometimes miss their appointments for follow-up and also forget to bring their old OPD cards.*" *-RMO, Balaganj, Sylhet*

Record keeping and reporting: Most UHCs did not have separate registry for record keeping of patients visiting NCD corners. Only three out of 12 UHCs had a separate register available for NCD patients. One KII stated:
"*There are separate register books for recording and reporting NCD cases. But the problem is NCD cases are reported both in regular register book and NCD corner register book, so there is always a chance of duplication in reporting NCD cases.*" *-RMO, Chowgacha, Khulna*

Challenges to strengthening the NCD services: At systems level: Almost all UH&FPOs shared their concern that there was not a proper communication and coordination between respective UHCs and the NCDC unit at DG Health Services in terms of establishment of NCD corner and discharging its' services. The gap existed in terms of availability and use of standard operating procedure, availability of basic logistics and essentials, the functional modality of NCD corner, HR composition, medicines and supplies and recording and reporting systems. One RMO highlighted this condition:
"We did receive a letter from the NCDC unit of DG health services last year, suggesting us to establish an NCD corner, however no detailed guidelines, standard operating procedure, logistics and supplies were provided." *-RMO, Balaganj, Sylhet*

Another UHFPO also indicated the need of supervision and monitoring:
"There has not been any supervision and monitoring from the NCDC unit, nor we have communicated with them regarding the NCD corner and its' service delivery mechanism."

-UH&FPO, Jhikorgacha, Khulna

The participants also shared about various concerns or challenges behind effective functioning of NCD services such as, having difficulties to identify MO for NCD corner, their trainings on NCDs, and finding paramedics to provide NCD services on a regular basis. One UH&FPO told:

"*We already have human resource crisis, there are not enough paramedics or doctors. Over that the rapid and frequent transfer of the trained NCD corner MO makes it even more challenging to keep the NCD corner fully functional.*" *-UH&FPO, Jhikorgacha Khulna*

At service delivery level: The basic essential medicines for NCDs available in the UHC were limited to common NCDs condition such as, diabetes and hypertension. In most cases, the MOs were found to be busy in providing OPD consultations thus, did not have adequate time for providing counselling and health education services. Those paramedics in the OPD either did not find enough time or had limited knowledge to provide proper counselling and health education services for NCDs prevention and control.

Additionally, there was a problem of not having regular laboratory facilities in the UHCs, so the patients were compelled to go to private lab and pay an expensive fee for laboratory services. One UH&FPO stated:

"We normally provide laboratory services at the UHC with very minimum cost. When the lab service is not available at UHC, we are compelled to refer them to private lab, where the cost is quite high. Patients do not like to go there, because of the high cost they charge to the patients. Even patients sometime do not perform investigation at all, again because of the cost that they can't afford.

-UH&FPO, Munshiganj Dhaka

Other challenges identified including the patient's lower awareness of NCD conditions and negligence in bringing previous prescriptions during the follow-up visits. All of these were the added challenges for MO working in NCD corner. As such, one RMO expressed:

"*People are not aware about the importance of book and booklets. They are not even aware that they need to come with their previous prescriptions for follow-up visit, which makes MO's job harder for proper investigation, diagnosis and quality care.*" *-RMO, Chowgacha, Khulna*

Perceived solutions to addressing the NCDs challenges: Participants suggested the following possible measures to address the challenges.

(i) Communication and coordination: All participants recommended communication and coordination between respective UHCs and the NCDC unit need to be maintained.

(ii) Infrastructure, logistics, equipment and medicine: Participants identified the need of adequate physical infrastructure, necessary equipment such as glucometer, strips for random blood glucose test, ECG machine and batteries to operate the equipment. Furthermore, a need for regular supply of NCD medicines, and having available the IEC and BCC materials was suggested.

(iii) Trained human resources: Participants strongly recommended a dedicated NCD corner team, which may comprise trained MO, paramedics such as Medical Assistant, a Nurse and supporting staff.

Discussion

This study provided overview on the current status of NCD corners as well as highlighted the challenges and opportunities in strengthening the NCD services provided through the NCD corners in Bangladesh. Given the increasing burden of NCD in the country, there has been a greater need for developing a feasible mechanism that addresses the problems of NCDs, meets the service delivery needs, and the services are provided at the grassroot level with affordable cost. The initiative taken by the Bangladesh government to establish NCD corners in UHCs is vital to prevention and control of NCDs. However, the findings from this study suggest that the NCD corners are currently functioning ineffectively with issues existing at systems and service delivery levels.

NCDs current scenario: At UHC and below levels, the most common NCD problems that people were suffering included hypertension, diabetes and COPD. However, other health problems, such as mental health, road traffic accident and cancer were also the reasons for attending these services. These findings corroborate to the current situation of NCDs in Bangladesh, where majority of the deaths occurred due to NCDs. The burden of NCDs is also increasing rapidly globally. World Health Organisation (WHO) reports that an estimated 59% of total deaths (886,000) that occurred in 2012 in Bangladesh was attributable to NCDs including CVD, diabetes, COPD, cancer and mental health problems.[18] Over the past 20 years, there has been a nine fold increase of deaths from NCDs [19]and this is likely to increase if no appropriate actions are taken seriously.[3 9 20]

Service readiness: We identified lack of service readiness including shortages of physical and human resources, lack of logistics and drug supplies in the NCD corners. The shortages of trained health care providers aligns with the one shortages of HRH at the systems level in Bangladesh, where the overall shortages of trained human resources exists, in particularly in rural Bangladesh.[21 22] This shortages of trained human resources does not meet the WHO recommended ratio or health care providers (1: 3: 5) for providing basic health care at the primary care level.[23] Trained health care providers play vital roles in the efforts of prevention and control of NCDs. Studies in sub-Saharan Africa have reported that poor knowledge and experience of front-line health workers were major barriers to care and services for NCDs.[24-26] Alternatively, studies in this Asian continent have established proper training and supervision of non-medical-doctor clinicians or nurse-led clinics could provide effective primary care for NCDs.[27-29] However, in the context of Bangladesh, such provisions of task-shifting for NCDs services for non-medical health workforce is unavailable. Studies reported lack of different aspects of care at UHC [6 7 30-32], which range from basic equipment to logistics, supplies, diagnostic services, medicines and specialized care, recording, reporting and referral. Study also identified lack of/poor quality of medicines as cause of patient dissatisfaction in government health facilities in Bangladesh.[32] A study in India reported discordance in availability of recommended class of drug for CVDs at primary health care levels.[33]

NCD services: Other important finding of this study is that, the NCD corners lack facilities and equipment essential for NCDs screening and early diagnosis, such as glucometer set, nebulizer set, ECG set and laboratory facilities to perform blood glucose measurement. NCDs early screening and diagnosis are crucial to the NCDs prevention and control efforts, in particular in countries like Bangladesh, where the cost of treatment and medication are so expensive that most of the people could

not afford these services.[34 35] These findings corroborate to the findings from other neighbouring country, Nepal.[34] Mishra et. al., reported that lack of infrastructure, basic supplies, equipment and mechanism are major issues to combat issues of NCDs at primary health care levels in Nepal. People with NCDs often travel to the secondary or tertiary level hospitals, generally located in urban areas and using the NCD services from those urban cantered hospitals is often quite challenging and medications are expensive.

Challenges to NCD service strengthening: The findings of this study also highlighted some key challenges including no specific guidelines and standard operating procedure to guide NCD service providers; inadequate communication between NCD control unit of DG health services and respective UHCs; poor recording and reporting systems and no robust mechanism to ensure effective operation of NCD corners. Findings from other studies in Bangladesh have suggested that the health systems is not yet well prepared to combat problem of NCDs.[7 15 36] For example, Roman et. al, (2015) using a scorecard for tracking actions to NCDs, reported low performance scores in three out of four domains of score card including risk factor surveillance, research, and health system response, and the governance component received moderate performance scores.[36] Similarly, Bangladesh Health Watch Report 2016, also documented that government's role has been very limited to provide NCDs and related services to combat the growing burden of NCDs in Bangladesh.[7] However, the needs for developing a functional team and a service delivery system in resource poor setting is possible and been highlighted by different literature.[35 37]

Limitations: We could only include 12 NCD corners of 12 selected UHCs across four administrative divisions due to time and resource constraints. Addition of other UHCs and the NCD corners might have added diverse insights in terms of government's efforts to NCDs prevention and control in Bangladesh. Also, due to the same reason, we were not able to collect information from the patients' which could also have added further insights in terms of service recipients' perspective. The same can be said about the policymakers and managers high up in the ministry and DG Health Services, whom we could not interview, again due to the above constraints.

Conclusion: The findings provide current insights about the situation and the challenges faced by NCD corners located in different UHCs across the four divisions of Bangladesh. We conclude that the NCD corners remain poorly functioning with many challenges at systems and service delivery levels. These include (a) lack of trained human resources, (b) inadequate equipment and laboratory facilities, (c) logistics and drug supplies, (d) proper recording and reporting, (e) coordination/ communication with the NCDC unit of DG health services and (f) lack of proper guidelines and standard operating procedure.

The NCD corners are still at a nascent stage. The capacity of the NCD corners to screen for NCDs and subsequent investigation, treatment, referral, recording & reporting and follow-up needs to be improved. These require improvement of physical infrastructure, equipment, logistics and supplies, trained human resources, and proper communication and coordination between NCD control unit of DG health services and respective UHCs, along with expert advice for long-term systems

strengthening. These should be seriously taken into consideration prior to expanding these NCD corners to other UHCs.

Consent to publish: Not applicable. The manuscript does not include details, images, or videos relating to an individual person.

Patient consent for publication: Not applicable.

Contributors: LR, KK, TB, MIT, and SMA contributed conceptualizing the study, drafting the manuscript and finalization. LR, TB and MIT contributed in data analyses and results write up. PP, ASA, AMNR, SMSI, KK, and SMA thoroughly reviewed the manuscript and contributed substantially for necessary revision. LR, KK, TB, ASA, AMNR and SMA final reviewed the manuscript and prepared for submission.

Funding: This study received financial support from the Centre of Excellence for Universal Health Coverage (CoE-UHC), BRAC University, Bangladesh.

Competing interests: All authors declare no competing interest.

Availability of data and materials: The qualitative data used and analysed in this study can be available from the corresponding author on reasonable request.

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BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-029562.R1
Article Type:	Original research
Date Submitted by the Author:	14-Jun-2019
Complete List of Authors:	Rawal, Lal; Western Sydney University School of Social Sciences and Psychology Kanda, Kie; Japanese International Cooperation Agency (JICA) Ghana Biswas, Tuhin; The University of Queensland, Long Pocket Precinct, Indooroopilly Queensland, Australia Tanim, Md. Imtiaz; mPower Social Enterprises Ltd. Dhaka, Bangladesh Poudel, Prakash; Collaboration for Oral Health Outcomes, Research, Translation and Evaluation (COHORTE) research group. Western Sydney University, Ingham Institute of Applied Medical Research Renzaho, Andre; Western Sydney University, School of Social Sciences and Psychology Abdullah, Abu; Global Health Program, Duke Kunshan University, Jiangsu 215347, China ; Boston University School of Medicine, Boston Medical Center, Boston, Massachusetts 02118, USA Shariful Islam, Sheikh Mohammed; Deakin University Faculty of Health, Exercise & Nut. Sci.; The George Institute for Global Health, Cardiovascular Division Ahmed, Syed Masud; James P Grant School of Public Health, BRAC University, Centre of Excellence for UHC
Primary Subject Heading:	Health services research
Secondary Subject Heading:	Public health, Health policy
Keywords:	PUBLIC HEALTH, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Service delivery, Non-communicable disease

Non-communicable disease (NCD) corners in public sector health facilities in Bangladesh: Challenges and opportunities for improving NCD services at primary health care level

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Running title: NCD corners in Bangladesh …

Abstract

Objective: To explore health care providers' perspective on non-communicable disease (NCD) prevention and management services being provided by the NCD corners in Bangladesh. To determine challenges and opportunities in strengthening NCD delivery services at primary health care level.

Design: We used qualitative narrative inquiry approach involving in-depth qualitative interviews with health care providers. We also used health facility observation check-list to assess the NCD service readiness. Further, a stakeholder meeting with participants from the government, non-government organisations (NGOs), private sector, universities, and health media was conducted.

Setting: Twelve sub-district health facilities, called as upazila health complex (UHC) across four administrative divisions.

Participants: Upazila health and family planning officers (n=4), resident medical officers (n=6), medical doctors (n=4) and civil surgeon (n=1). Participants of stakeholder meeting were health policy makers, health program managers, researchers, academician, NGOs workers, private health practitioners, and health journalists.

Results: Participants reported that diabetes, hypertension and chronic obstructive pulmonary disease were the major NCDs related problems. Governments' initiative to establish and strengthen NCD corners was acknowledged. Participants highlighted that NCD corners have contributed substantially in terms of increased NCD awareness, NCD care at community level, and providing referral services.

However, participants identified several challenges including lack of specific guidelines and standard operating procedures; lack of trained human resources; inadequate laboratory facilities, logistics and NCD medicines; and poor recording and reporting systems. Participants recommended needs for adequate training to NCD corner staff; allocation and supply of resources (finance, logistics/drugs); and development of specific guidelines and SOP.

Conclusion: The initiative taken by the Government of Bangladesh, primarily setting up NCD corners at primary care level, is appreciative. However, the NCD corners are still at nascent stage in terms of providing NCDs prevention and management services. These need adequate consideration before expanding the NCD corners in other UHCs in the country.

Strengths and limitations of the study:

- In order to address the growing burden of non-communicable diseases (NCDs), the Government of Bangladesh, in recent years, has taken initiatives to establishing the NCD corners at sub-district level health facilities. To the best of our knowledge, this is the first study ever been conducted to assess the services provided by these NCD corners and examined challenges and opportunities to strengthening NCD services.
- We have identified a range of possible opportunities to strengthening NCD services, which include (i) Government's commitment to NCD prevention and control; (ii) setting up NCD corners at sub-district level as first point of care; (iii) allocation of health care staff for NCD corner; (iv) allocation resources (finance, logistics/ drugs and supplies); (v) NCD education and counselling to increase awareness and; (vi) referral and follow up services when needed etc.
- We have also highlighted several challenges to the implementation of NCD corners, which include (i) absence of specific guidelines and standard operating procedure; (ii) lack of trained human resources; (iii) inadequate physical and laboratory facilities and (iv) poor recording and reporting systems.
- One of the key limitations of this study was, we were unable to include beyond four administrative divisions. Having additional sub-districts included in this study could have added additional diverse insights. Further, this study did not collect data from the patients, which could have added insights from the service recipients' perspective, but was out of the scope of this study.
- The NCD corners are still at a nascent stage, therefore the capacity of the NCD corners to screen for NCDs and subsequent systems for investigation, medication, referral, recording & reporting and follow-up needs improvement, while Government of Bangladesh is planning to expand these NCD corners to other sub-district level health facilities in the country.

Introduction

Like other low and middle-income countries (LMICs), Bangladesh is experiencing rapid demographic and epidemiological transitions[1-3], and subsequent rise in ageing population and the burden of non-communicable diseases (NCDs).[2-4] The Global Burden of Disease study estimated that the proportion of deaths due to NCDs in Bangladesh increased from 43.4% in 2000 to 66.9% in 2015[5], and this poses a major challenge for the Bangladesh's existing health care systems, which are mainly geared towards addressing communicable diseases.[6 7] The impact of NCDs on national economy, communities, families and individuals is unbearable[8-10] and this is likely to be more serious in coming years, as the number of people with risk for developing NCDs increases.[11-14] Recent studies have shown that the NCD risk factors including overweight, underweight, hypertension, dyslipidemia, physical inactivity, tobacco smoking and low consumption of vegetables were common among adults living in urban[12-14] as well as rural areas[12] and among the adults of all economic quintiles.[9]

In recent years, the government of Bangladesh has taken initiatives to combat NCDs at system, institutional and service delivery levels. National NCD plan has been developed; a dedicated NCD control unit housed within the Directorate General of Health Services, within the Ministry of Health and Family Welfare has been established in 2011. Since 2012, the government initiated NCD corner in upazila (sub-district) health complexes (UHCs) for addressing NCDs. These NCD corners are dedicated centres to provide prevention and care services for NCDs and related conditions such as cardiovascular diseases (CVDs), diabetes, and chronic respiratory diseases (asthma and chronic obstructive pulmonary disease) and screening for certain cancers.[6]

Though the national guidelines for NCDs surveillance has been developed, the implementation of the guideline's provisions and services has remained weak.[7] At the union and upazila levels, where the doctors are posted, NCD prevention and management services are not systematically offered.[15] It is encouraging that the government plans to scale-up NCD corners, however, to date no robust information is available to explain the current situation of these NCD corners. It is important to know how these NCD corners are functioning, what are the challenges and gaps along the implementation process of these NCD corners, and how the service delivery could be strengthened. Thus, the aim of this study were to assess the services provided by NCD corners and to determine the challenges and opportunities for strengthening NCD services provided by the NCD corners in Bangladesh.

Methods

Setting: Bangladesh currently has seven administrative divisions, which are divided into 65 districts, called as Zila, and 493 sub-districts, called as upazila. In our study, 12 selected NCD corners located at 12 UHCs (1 NCD corner per UHC), of four administrative divisions including Dhaka, Sylhet, Khulna and Chittagong, were included in this study.

***Study design*:** We used a qualitative narrative inquiry approach[16] involving in-depth qualitative interviews with key health care providers. Narrative inquiry is a way of understanding experiences of participants and also involves understanding the social and contextual aspects. In this approach, researchers have important roles to contribute to the inquiry process. Participants' awareness about the current situation of NCDs and approaches to addressing NCDs and their perceptions were explored through in-depth key informant interviews (KIIs), stakeholder meeting and a series of meetings with health care providers. An NCD corner facility checklist was developed and was used to audit NCD corners. During the stakeholder meeting, we presented preliminary findings of the study and gathered feedback, comments and suggestion from the participants to supplement and verify the information gathered from the KIIs and observation check-list. The participants of the stakeholder meeting representatives from the government, NGOs, private sector, universities, and health media

***Sampling strategy*:** A multi-stage sampling strategy was used (See Figure 1). A list of UHCs and NCD corners according to the administrative divisions and the respective districts was prepared. Twelve NCD corners of four administrative divisions were selected using convenience sampling and ensuring representation of diverse geographical areas including haor (wetland area), coastal, rural and hill tract.

INSERT FIGURE 1 HERE

Study tools development: An in-depth KII guideline was developed and determined by an extensive review of relevant literature, government reports and guidelines, available relevant tools and consultation with government officials at DG health services and Ministry of Health and Family Welfare. The study team and NCDs experts reviewed the interview guidelines and NCD corner checklist in order to ensure face validity. The health facility check-list was developed based on the review of available tools in Bangladesh, in particularly the Bangladesh health facility survey (2014)[17], list of essential drugs and supplies by DGHS, HMIS reporting format and list of NCDs drugs supplied by the DG Health Services Bangladesh.

***Ethics approval and consent to participate*:** The ethics approval of this study was obtained from the Ethics Review Committee of international centre for diarrhoeal disease research Bangladesh (icddr,b) (Protocol approval no. PR-16068). Prior to interviews, the participants were fully informed about the study objectives and were explained about the use of data. Informed written consent was obtained prior to the interview and consent written was also sought for tape recording of the interviews.

***Data collection*:** Data were collected from 12 NCD corners of four divisions. NCD corner facility checklist was not used in Ramu and Teknaf UHCs as there were not an established NCD corners during the data collection period. Fifteen qualitative key informant interviews were conducted. Given the language efficiency of health care providers, the interviews were conducted in English medium by the principal investigator (LR) of the study. The interviews were tape recorded and detailed notes were taken during the interview. The KIIs included upazila health and family welfare officer (UH&FPO) (n=4), resident medical officer (RMO) (n=6), medical officers (MO) (n=4) and civil

surgeon (n=1). We achieved the data saturation with 10 participants but kept the recruitment process continuing to ensure the participants were well representative from all geographical areas including haor (wetland area), coastal, rural and hill tract. The health facility checklist with major areas of (a) availability of basic infrastructure, (b) equipment and supplies, (c) laboratory facility, (d) human resources for health, (e) NCDs essential drugs and other relevant medications, was used. A stakeholder meeting with participants from government, non-government organisations (NGOs), private sector, universities, and health media was conducted and their feedback, comments and suggestions were incorporated. Further, A series of informal group discussions were also held with the health care providers of the respective UHCs.

Patient and public involvement: No patient or public was involved.

Data analysis: The audio recordings of the interviews were transcribed into verbatim by one of the research team members (TB). Coding of the qualitative data and identification of themes from the transcripts were carried out using a thematic approach. A thematic analysis process that involves an identification of themes through careful reading and reading of transcripts against the research questions was used for the analysis. The process of coding involved an inductive approach and the common themes were identified by comparing and contrasting the patterns and meanings of the expressions among participants. The process of reading transcripts, coding and analysis of the qualitative data was undertaken independently by two researchers (LR and TB) and further checked for accuracy by another 2 members (KK and IT). All team members reviewed the final themes and a consensus was achieved resolving the discrepancies through discussion. A final set of six major themes were identified and the qualitative findings are presented, accordingly. Participants were deidentified throughout the transcription to ensure the confidentiality and anonymity and the pseudonyms (such as MO, UH&FPO, RMO, CS) were used to identify expressions and quotations of the participants.

Results

The participants of the study opined that the NCD burden is increasing rapidly in Bangladesh and the government's initiative to establish and strengthen NCD corner at UHC level to address the problem of NCD is highly appreciated. Participants noted several challenges including human resources recruitment and deployment, capacity building, supplies of drugs and logistics, service delivery, recording and reporting and communication and coordination etc. The findings are presented in following themes.

NCDs current scenario: Participants reported that the most common reasons for patients' visit to NCD corners were diabetes, cardiovascular diseases (CVD) and Chronic Obstructive Pulmonary Disease (COPD), followed by other problems (i.e. mental health, cancers and road traffic accidents). In most cases, the patients visited health facilities not knowing that they had developed NCDs.

"*It is somehow difficult to identify patients with NCDs as people do not usually come to treat NCDs. The patients come with general sickness and sometimes hide or even forget to mention symptoms that might help to identify NCD cases.*" *-MO, Ramu UHC, Chittagong*

NCDs service readiness (physical and human resources, equipment, logistics and drugs): All NCD corners contained with the basic equipment required for NCD corner, such as BP measurement set, weighing scale and height measurement scale. One NCD corner which had glucometer set available (Munshiganj) but the supplies, such as glucometer strips and batteries were out of stock, so the glucometer test set was unused.

"*BP machine and glucometer set along with other measuring tools are available in our NCD corner. But the problem is that we don't have enough glucose measuring strips.*" *-MO, Munshiganj, Dhaka*

In terms of human resources, participants shared their concern that there was no designated position for the medical officer (MO), paramedic and nurse in NCD corners. In general, the MO and other staff were assigned locally by the health facility in-charge.

"*There is no such team working here at the NCD corner. Only the NCD MO is working for NCD corner. The senior nurse and a paramedic are involved but not dedicated to NCD corner, they are responsible to overall OPD services.*" *-MO Devbhata, Khulna*

Logistics and drugs were supplied upon request from the Civil Surgeon's Office (district health office) on a monthly basis and also when needed in case of emergency. The NCD related drugs were supplied within the regular drug supply schedule and in most cases, drugs were not supplied on a regular basis.

"*For the OPD patients, the type of medicines dispensed depends on the availability of medicine. We always try to provide whatever medicines are available at the dispensary, but in most cases, we have stock out of NCD drugs, so patients are advised to purchase medicines from the private drug shops.*"

-UH&FPO, Jhikorgacha, Khulna

In order to supplement information concerning NCDs service readiness, we also collected data using NCD health facility observation checklist **(Table 1).** All NCD corners had availability of basic equipment, however other essential equipment and supplies were not available. Also, the shortage for laboratory facilities in all UHCs was reported. All UHCs had the MO and paramedics locally assigned. NCD drugs were unavailable in almost all UHCs, except few UHCs of Khulna Division and one UHC of Dhaka division had some relevant NCD drugs available.

Table 1. Service readiness (availability of basic infrastructure, equipment, diagnostic services, supplies and medication)

Physical infrastructure	Khulna division				Dhaka division			Sylhet division		
UHCs code ⇨	1	2	3	4	5	6	7	8	9	10
Basic infrastructure										
Adequate lighting	√	√	√	√	√	√	√	√	√	√
Water and sanitation facilities	√	√	√	√	√	√	√	√	√	√
Space, cleanliness, ventilation	√	√	√	√	√	√	√	√	√	√
Storage facility/ Refrigeration	×	×	×	×	×	×	×	×	×	×
Furniture (patient examination bed, chairs & table)	√	√	√	√	√	√	√	√	√	√
Basic equipment and supplies										
Weighting scale	√	√	√	√	√	√	√	√	√	√
Measuring tape	√	√	√	√	√	√	√	√	√	√
Height measure	√	√	√	√	√	√	√	√	√	√
Stethoscope	√	√	√	√	√	√	√	√	√	√
BP measurement set	√	√	√	√	√	√	√	√	√	√
NCD patient register book	×	×	×	×	×	×	×	×	×	×
Clinical protocol for NCDs	×	×	×	×	×	×	×	×	×	×
NCDs related IEC materials	×	×	×	×	×	×	×	×	×	×
Investigation and laboratory facilities										
Glucometer set	×	×	×	×	×	×	×	×	×	×
ECG set	×	×	×	×	×	×	×	×	×	×
Urine protein test by strips	√*	√	√	√*	√	√*	√	√*	√*	√*
Urine Ketone test by strips	√	√*	√	√	√*	√	√*	√*	√*	√
Blood Cholesterol assay	√	×	√	×	√	×	×	×	×	√
Lipid Profile	√	√	√	×	√	×	√	√	×	√
Serum Creatinine assay	√	×	√	×	×	×	√*	×	×	×
Troponin Test by strips	×	×	×	×	×	×	×	×	×	×
Urine test strips	√	×	√	×	√	×	×	×	×	×
Fasting blood sugar test	√	√*	√	√*	√*	√*	√*	√*	√*	√*
BS 2Hrs ABF	√	√*	√	×	√*	×	√*	×	√*	√*
HbA1c	×	×	×	×	×	×	×	×	×	×
Human resources										
Medical Officer	√	√	√	√	√	√	√	√	√	√
Nurse	√	√	√	√	√	√	√	√	×	√
Others support staff	√	√	√	√	√	×	√	×	√	×
Availability of NCDs drugs										
Metformin	√	√	×	×	√	×	×	×	×	×
Insulin	×	×	×	×	×	×	×	×	×	×
Glibenclamide	×	×	×	×	×	×	×	×	×	×
Amlodipine (Tab. Amdocal)	√	√	×	×	√	×	×	×	×	×
Tab Nifedipine	×	×	×	×	×	×	×	×	×	×
Hydrochlorothiazide	×	√	×	×	×	×	×	×	×	×
Propranolol	×	×	×	×	×	×	×	×	×	×
Atenolol	×	×	×	×	×	×	×	×	×	×
Furosemide	×	×	×	×	×	×	×	×	×	×
Spironolactone	×	×	×	×	×	×	×	×	×	×

* Reagent/ lab technician was not available during the period of data collection; √ denotes availability of services; × denotes unavailability of services

UHC codes = 1: Chowgacha UHC; 2: Zhigorgacha UHC; 3: Kaligong UHC; 4: Devhata UHC; 5: Mushigong UHC; 6: Hazigong UHC; 7: Golapgong UHC; 8: Balagong UHC; 9: Fenchugong UHC; 10: Chatok UHC

NCDs screening, diagnosis, treatment, follow-up and referral: Participants reported that the services available in the NCD corners were limited to general consultation, health education and counselling. Patients with possible NCD problems are advised from the OPD registration booth to visit the NCD corner for OPD consultation. Patients were advised to perform necessary investigations when required. Those patients requiring further attention, were referred to the specialists such as cardiologist, endocrinologist, and pulmonologist. In most cases, the specialists were not available in the UHCs. One MO stated:

"*The patients generally receive basic NCD services including consultation, basic investigation, and treatment and advice from us. In case the case is not manageable or too serious, we refer the patients to the district hospital.*" *-UH&FPO Teknaf, Chittagong*

Another MO described about the follow-up process:

"*We do not have formal system to follow-up the patients, but I always tell the patients for follow-up visit after a certain duration and also I suggest them to bring the old OPD card during the next visit." -MO, Munshiganj, Dhaka*

In contrast, another participant mentioned that:

"*Among the patients, who come for follow-up, the diabetes patients are very much aware and regular but the hypertension patients sometimes miss their appointments for follow-up and also forget to bring their old OPD cards.*" *-RMO, Balaganj, Sylhet*

Record keeping and reporting: Most UHCs did not have separate registry for record keeping. Only three had a separate register available for NCD patients. One KII stated:

"*There are separate register books for recording and reporting NCD cases. But the problem is NCD cases are reported both in regular register book and NCD corner register book, so there is always a chance of duplication in reporting NCD cases.*" *-RMO, Chowgacha, Khulna*

Challenges to strengthening the NCD services: At systems level: Almost all UH&FPOs shared their concerns that there was not a proper communication and coordination between respective UHCs and the NCDC unit at DG Health Services relating to the establishment of NCD corner and its services. The gap existed in terms of availability and use of standard operating procedure, availability of basic logistics and essentials, the functional modality of NCD corner, HR composition, medicines and supplies and recording and reporting systems. One RMO highlighted:

"We did receive a letter from the NCDC unit of DG health services last year, suggesting us to establish an NCD corner, however no detailed guidelines, standard operating procedure, logistics and supplies were provided." -RMO, Balaganj, Sylhet

Another UHFPO indicated needs for supervision and monitoring:

"There has not been any supervision and monitoring from the NCDC unit, nor we have communicated with them regarding the NCD corner and its' service delivery mechanism."

-UH&FPO, Jhikorgacha, Khulna

The participants also shared various concerns and challenges such as, having difficulties to identify MO for NCD corner, their trainings on NCDs, and finding paramedics to provide NCD services on a regular basis. One UH&FPO told:

"*We already have human resource crisis, there are not enough paramedics or doctors. Over that the rapid and frequent transfer of the trained NCD corner MO makes it even more challenging to keep the NCD corner fully functional.*" *-UH&FPO, Jhikorgacha Khulna*

At service delivery level: The basic essential medicines available for NCDs at UHC were limited to common NCDs condition such as, diabetes and hypertension. In most cases, the MOs were busy in providing OPD consultations thus, did not have adequate time for providing counselling and health education. At the same time, paramedics in the OPD either did not find enough time or had limited knowledge to provide proper counselling and health education for NCDs prevention and control.

Participants also raised concern about the lack of regular laboratory facilities in the UHCs, which compelled patients to visit private laboratory. One UH&FPO stated:

"We normally provide laboratory services at the UHC with very minimum cost. When the lab service is not available at UHC, we are compelled to refer them to private lab, where the cost is quite high. Patients do not like to go there, because of the high cost they charge to the patients. Even patients sometime do not perform investigation at all, again because of the cost that they can't afford.

-UH&FPO, Munshiganj Dhaka

Other challenges identified were patients' poor awareness of their own NCD conditions and negligence in bringing previous prescriptions during the follow-up visits. All of these were the added challenges for MO working in NCD corner. As such, one RMO expressed:

"*People are not aware about the importance of book and booklets. They are not even aware that they need to come with their previous prescriptions for follow-up visit, which makes MO's job harder for proper investigation, diagnosis and quality care.*" *-RMO, Chowgacha, Khulna*

Perceived solutions to addressing the NCDs challenges: Participants in KII and stakeholders meeting suggested the following possible measures to address the challenges.

(i) Communication and coordination: All participants recommended communication and coordination between respective UHCs and the NCDC unit need to be maintained.

(ii) Infrastructure, logistics, equipment and medicine: Participants identified the need of adequate physical infrastructure, necessary equipment such as glucometer, strips for random blood glucose test, ECG machine and batteries to operate the equipment. Furthermore, a need for regular supply of NCD medicines, and having available the IEC and BCC materials was suggested.

(iii) Trained human resources: Participants strongly recommended a dedicated NCD corner team, which may comprise trained MO, paramedics such as Medical Assistant, a Nurse and supporting staff.

Discussion

This study provided an overview on the current status of NCD corners and highlighted the challenges and opportunities in strengthening the NCD services provided through the NCD corners in Bangladesh. Given the increasing burden of NCDs in the country, there has been a greater need for developing a feasible mechanism that addresses the problems of NCDs, meets the service delivery needs, and ensures the services are provided at the grassroot level with affordable cost. The initiative taken by the Bangladesh government to establish NCD corners in UHCs is vital to prevention and control of NCDs. The findings of this study describe the current challenges that NCD corners are facing, which should guide the policy makers to take measures in strengthening NCD services, delivered through NCD corners.

NCDs current scenario: The findings related to common NCD problems such as CVD, diabetes, and COPD, which we have noted in this study, corroborate the current situation of NCDs in Bangladesh. According to the World Health Organisation (WHO), an estimated 59% of total deaths (886,000) that occurred in 2012 in Bangladesh was attributable to NCDs including CVD, diabetes, COPD, cancer and mental health problems.[18] Over the past 20 years, there has been a nine fold increase of deaths from NCDs [19]and this is likely to increase if no appropriate actions are taken seriously.[3 9 20]

Service readiness: We identified lack of service readiness to address the problem of NCDs at primary care level. The shortages of trained health care providers aligns with the overall shortages of trained HRH in Bangladesh, in particularly the rural areas.[21 22] This shortages of trained human resources does not meet the WHO recommended ratio or health care providers (1: 3: 5) for providing basic health care at the primary care level.[23] Trained health care providers play a vital role in the efforts of prevention and control of NCDs. Studies in sub-Saharan Africa have reported that poor knowledge and experience of front-line health workers were major barriers to care and services for NCDs.[24-26] Alternatively, studies in this Asian continent have established proper training and supervision of non-medical-doctor clinicians or nurse-led clinics could provide effective primary care for NCDs.[27-29] However, in the context of Bangladesh, such provisions of task-shifting for NCDs services for non-medical health workforce is still unavailable. Studies reported lack of different aspects of care at UHC [6 7 30-32], which range from basic equipment to logistics, supplies, diagnostic services, medicines and specialized care, recording, reporting and referral. Study also identified lack of/poor quality of

medicines as cause of patient dissatisfaction in government health facilities in Bangladesh.[32] A study in India reported discordance in availability of recommended class of drug for CVDs at primary health care levels.[33]

NCD services: The findings of this study show that the NCD corners currently lack the facilities and equipment essential for NCDs screening and early diagnosis. NCDs early screening and diagnosis are crucial to the NCDs prevention and control efforts, particularly in countries like Bangladesh, where the cost of treatment and medication are so expensive that most of the people could not afford these services.[34 35] These findings corroborate to the findings of a study conducted in a low resource neighbouring country, Nepal.[34] Mishra et. al., reported that lack of infrastructure, basic supplies, equipment and mechanism are major issues to combat issues of NCDs at primary health care levels in Nepal.[34] People with NCDs often travel to the secondary or tertiary level hospitals, generally located in urban areas and using the NCD services from these urban hospitals is often geographically inaccessible with high cost.

Challenges to NCD service strengthening: The findings of this study also highlighted some key challenges that exist at systems and service delivery levels. Other studies in Bangladesh suggested that the health systems of Bangladesh are not yet well prepared to combat problem of NCDs.[7 15 36] For example, Roman et. al, (2015) using a scorecard for tracking actions to NCDs, reported low performance scores in three out of four domains of score card including risk factor surveillance, research, and health system response, and the governance component received moderate performance scores.[36] Similarly, Bangladesh Health Watch Report 2016, documented that government's role has been very limited to provide NCDs and related services to combat the growing burden of NCDs in Bangladesh.[7] However, developing a functional team and a service delivery system in resource poor setting is possible and has been highlighted by several studies but needs to be translated into action.[35 37]

Limitations: One of the key limitations of this study was, we were unable to include beyond four administrative divisions. Having additional sub-districts included in this study could have added additional diverse insights. However, we believe that our findings are transferrable considering that the results are consistent with other studies. Further, we were unable to collect data from the patients, which could have added insights from the service recipients' perspective, but was out of the scope of this study.

Conclusion: The findings provide current insights about the situation and the challenges faced by NCD corners located in different UHCs across four divisions in Bangladesh. We conclude that the NCD corners remain poorly functioning with many challenges at systems and service delivery levels. These include (a) lack of trained human resources, (b) inadequate equipment and laboratory facilities, (c) logistics and drug supplies, (d) proper recording and reporting, (e) coordination/ communication between NCD corners and NCDC unit of DG health services and (f) lack of proper guidelines and standard operating procedure.

The NCD corners are still at a nascent stage. The capacity of the NCD corners to screen for NCDs and subsequent investigation, treatment, referral, recording & reporting and follow-up needs improvement. These require upgrading physical infrastructure, supply of basic equipment and logistics, availability of trained human resources team for NCD corner, and proper communication and coordination between NCD control unit of DG health services and respective UHCs, along with expert advice for long-term systems strengthening. These need serious consideration prior to expanding these NCD corners to other UHCs.

Consent to publish: Not applicable. The manuscript does not include details, images, or videos relating to an individual person.

Patient consent for publication: Not applicable.

Contributors: LR, KK, TB, MIT, and SMA contributed conceptualizing the study, drafting the manuscript and finalization. LR, TB and MIT contributed in data analyses and results write up. PP, ASA, AMNR, SMSI, KK, and SMA thoroughly reviewed the manuscript and contributed substantially for necessary revision. LR, KK, TB, ASA, AMNR and SMA final reviewed the manuscript and prepared for submission.

Funding: This study received financial support from the Centre of Excellence for Universal Health Coverage (CoE-UHC), BRAC University, Bangladesh.

Competing interests: All authors declare no competing interest.

Availability of data and materials: The qualitative data used and analysed in this study can be available from the corresponding author on reasonable request.

Figure Title and Legend:

Figure 1: Flow chart describing sampling strategy and data collection process in the study.

NCD: non-communicable disease; UHC: upazila health complex; NCDC unit: NCD control unit; DG: director general of health services; KII: key informant interviews

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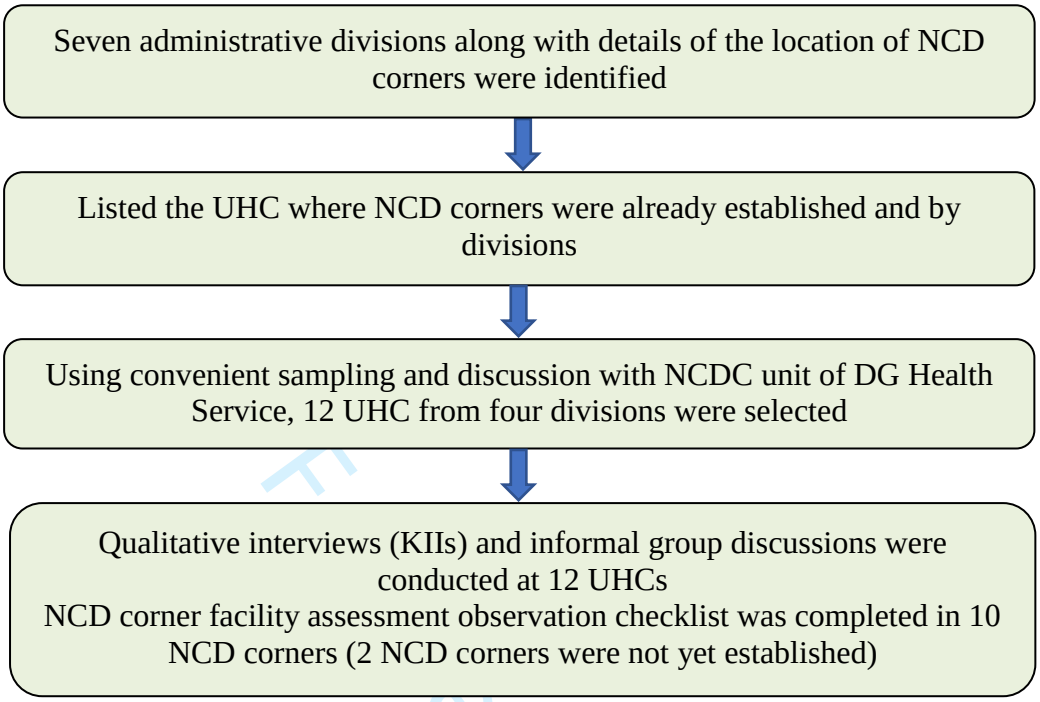

BMJ Open

Non-communicable disease (NCD) corners in public sector health facilities in Bangladesh: Challenges and opportunities for improving NCD services at the primary health care level

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-029562.R2
Article Type:	Original research
Date Submitted by the Author:	21-Aug-2019
Complete List of Authors:	Rawal, Lal; CQUniversity Sydney, School of Health Medical and Allied Sciences Kanda, Kie; Japanese International Cooperation Agency (JICA) Biswas, Tuhin; The University of Queensland, Long Pocket Precinct, Indooroopilly Queensland, Australia Tanim, Md. Imtiaz; mPower Social Enterprises Ltd. Dhaka, Bangladesh Poudel, Prakash; Collaboration for Oral Health Outcomes, Research, Translation and Evaluation (COHORTE) research group. Western Sydney University, Ingham Institute of Applied Medical Research Renzaho, Andre; Western Sydney University, School of Social Sciences and Psychology Abdullah, Abu; Global Health Program, Duke Kunshan University, Jiangsu 215347, China ; Boston University School of Medicine, Boston Medical Center, Boston, Massachusetts 02118, USA Shariful Islam, Sheikh Mohammed; Deakin University Faculty of Health, Exercise & Nut. Sci.; The George Institute for Global Health, Cardiovascular Division Ahmed, Syed Masud; James P Grant School of Public Health, BRAC University, Centre of Excellence for UHC
Primary Subject Heading:	Health services research
Secondary Subject Heading:	Public health, Health policy
Keywords:	PUBLIC HEALTH, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Service delivery, Non-communicable disease, HEALTH SERVICES ADMINISTRATION & MANAGEMENT

Non-communicable disease (NCD) corners in public sector health facilities in Bangladesh: Challenges and opportunities for improving NCD services at the primary health care level

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Running title: NCD corners in Bangladesh …

Abstract

Objective: To explore health care providers' perspective on non-communicable disease (NCD) prevention and management services provided through the NCD corners in Bangladesh; and to examine challenges and opportunities for strengthening NCD services delivery at the primary health care level.

Design: We used a grounded theory approach involving in-depth qualitative interviews with health care providers. We also used a health facility observation checklist to assess the NCD corners' service readiness. Further, a stakeholder meeting with participants from the government, non-government organisations (NGOs), private sector, universities, and news media was conducted.

Setting: Twelve sub-district health facilities, locally known as upazila health complex (UHC), across four administrative divisions.

Participants: Participants for the in-depth interviews were health service providers, namely Upazila health and family planning officers (n=4), resident medical officers (n=6), medical doctors (n=4) and civil surgeons (n=1). Participants for the stakeholder meeting were health policy makers, health program managers, researchers, academicians, NGO workers, private health practitioners, and news media reporters.

Results: Participants reported that diabetes, hypertension and chronic obstructive pulmonary disease were the major NCDs related problems. All participants acknowledged the governments' initiative to establish the NCD corners to support NCD service delivery. Participants thought the NCD corners have contributed substantially to increase NCD awareness, deliver NCD care, and provide referral services. However, participants identified challenges including lack of specific guidelines and standard operating procedures; lack of trained human resources; inadequate laboratory facilities, logistics and medications and poor recording and reporting systems.

Conclusion: The initiative taken by the Government of Bangladesh to set up the NCD corners at the primary health care level is appreciative. However, the NCD corners are still at nascent stage to provide prevention and management services for common NCDs. These findings need to be taken into consideration while expanding the NCD corners in other UHCs throughout the country.

Strengths and limitations of the study:

- This study is the first to assess the NCD services provided through the government led NCD corners in Bangladesh and to identify challenges and opportunities to strengthening NCD services at the primary health care level.
- We conducted 15 in-depth qualitative interviews with the public sector health care providers, collected data on the NCD service readiness using a health facility observation checklist and conducted a stakeholder meeting.
- Findings of this study are supportive of the national policy to expand NCD corners for improving NCD prevention and management services at the primary health care level.
- This study was unable to capture information beyond four administrative divisions, hence limiting the generalizability of our findings and we did not collect data from patients, which could have added additional insights from the consumers' perspective.

Introduction

Like other low and middle-income countries (LMICs), Bangladesh is experiencing rapid demographic and epidemiological transitions[1-3], and subsequent rise in ageing population and the burden of non-communicable diseases (NCDs).[2-4] The Global Burden of Disease study estimated that the proportion of deaths due to NCDs in Bangladesh increased from 43.4% in 2000 to 66.9% in 2015.[5] This increasing trends of NCDs poses a major challenge for the Bangladesh's existing health care systems, which are mainly geared towards addressing communicable diseases.[6 7] The impact of NCDs on national economy, communities, families and individuals is unbearable[8 9] and this is likely to be more serious in coming years, as the number of people with the risk of developing NCDs increases.[10-12] Recent studies have shown that NCD risk factors such as overweight, underweight, hypertension, dyslipidemia, physical inactivity, tobacco smoking and low consumption of vegetables were common among adults living in urban[13-15] as well as rural areas[14 16] including adults of all economic quintiles.[8]

In recent years, the government of Bangladesh has taken initiatives to combat NCDs at system, institutional, and service delivery levels.[17 18] A national NCD plan has been developed; and a dedicated NCD control unit housed within the Directorate General of Health Services (DGHS), Ministry of Health and Family Welfare (MoHFW), was established in 2011.[18 19] In 2012, the government initiated a new initiative, NCD corner at upazila (sub-district) health complexes (UHCs) for addressing NCDs. These NCD corners are dedicated to providing prevention and care services for common NCDs and related conditions such as cardiovascular diseases (CVDs), diabetes, and chronic respiratory diseases (asthma and chronic obstructive pulmonary disease); and screening for certain cancers.[6]

Though the national guidelines for NCDs surveillance have been developed, the implementation of these guideline has remained weak.[7] NCD prevention and management services are not yet systematically offered at the union level and all upazilas, where the medical doctors are posted.[20] Whilst the government plans to expand the NCD corners to other upazilas, to date no robust information is available to explain the current situation of these NCD corners. It is important to determine how these NCD corners are functioning, what are the challenges and gaps along the implementation process and service delivery, and how these NCD corners could be strengthened and institutionalised at the primary health care level. Thus, the aims of the study were twofold: 1) to explore health care providers' perspective on NCD prevention and management services provided through the NCD corners in Bangladesh, and 2) to examine challenges and opportunities for strengthening NCD delivery services at the primary health care level.

Methods

Setting: Bangladesh currently has seven administrative divisions, which are divided into 65 districts, called as Zila, and 493 sub-districts, called as upazila. In each upazila there is one health complex, named as upazila health complex (UHC). In this study, 12 purposively selected NCD corners located at 12 UHCs (1 NCD corner per UHC) of four administrative divisions- namely Dhaka, Sylhet, Khulna and Chittagong- were included.

***Study design*:** We used a grounded theory approach[21 22] involving in-depth qualitative interviews with health care providers. Grounded theory has considerable significance to qualitative research involving participants from the diverse background. This approach provides explicit, sequential guidelines for conducting qualitative research; offers specific strategies for handling the analytic phases of inquiry; streamlines and integrates data collection and analysis process; and advances conceptual analysis.[21] Participants' perceptions on and awareness of the current situation of NCDs and approaches to address them were explored through in-depth interviews, and a stakeholder meeting with health care providers. An NCD corner facility checklist was developed and was used to audit NCD corners. During the stakeholder meeting, we presented preliminary study's findings and gathered feedback, comments and suggestion from participants to supplement and verify the information from in-depth interviews and the observation checklist. Participants for the stakeholder meeting were representatives from the government, NGOs, private sector, universities, and news media.

***Sampling strategy*:** A multi-stage sampling strategy was used (See Figure 1). A list of UHCs and NCD corners according to the administrative divisions and the respective districts was prepared. Twelve NCD corners of four administrative divisions were selected using convenience sampling and ensuring representation of diverse geographical areas including haor (wetland area), coastal, rural and hill tract. Participants for in-depth interviews were the UH&FPO in-charge of the UHC and medical officers responsible for managing NCD services through NCD corners. An inventory of staff responsible for providing NCD services through the NCD corners was undertaken, then the participants were purposefully selected to achieve diversity in terms of experience, level of appointment and field of training.

Study tools development: An in-depth interview guide was developed and informed by an extensive review of relevant literature, government reports and guidelines, available relevant tools and consultation with government officials at DG health services and the Ministry of Health and Family Welfare. The study team and NCD experts reviewed the in-depth interview guide for clarity and comprehensiveness to suit the different levels of NCD service provision. A health facility check-list was developed based on the review of available tools and relevant studies in Bangladesh, particularly the Bangladesh health facility survey (2014)[23], and a list of essential and NCDs drugs and supplies by DGHS.

***Ethics approval and consent to participate*:** The ethics approval of this study was obtained from the Ethics Review Committee of international centre for diarrhoeal disease research, Bangladesh (icddr,b) (Protocol approval no. PR-16068). Prior to interviews, participants were fully informed about the study objectives and how obtained data will be used. All interviews were audio-recorded, hence informed written consent was obtained prior to the interview as well as for audio recording.

***Data collection*:** Data were collected from 12 NCD corners of four administrative divisions. An NCD corner facility checklist was not used in Ramu and Teknaf UHCs as NCD corners were established in these locations during the data collection period. Three main approaches were used for data collection (i) in-depth qualitative interviews, (ii) an NCD services facility checklist and (iii) a stakeholder meeting. Fifteen KIIs were conducted. Given the language proficiency of health care providers, all interviews were conducted in English by the principal investigator (LR) of the study. The investigator was trained in qualitative research and had no prior relationship with any of the participants. The interviews were audio-recorded and detailed notes were taken during the interview. We achieved the data saturation with 10 participants but kept the recruitment process continuing to ensure the participants were well representative from all geographical areas including haor (wetland area), coastal, rural and hill tract. The health facility checklist with major areas of (a) availability of basic infrastructure, (b) equipment and supplies, (c) laboratory facility, (d) human resources for health, (e) NCDs essential drugs and other relevant medications, was used. A stakeholder meeting with participants from government, non-government organisations (NGOs), private sector, universities, and news media was conducted, and their feedback, comments and suggestions were incorporated.

Patient and public involvement: No patient or public was involved.

Data processing and analysis: The audio recordings of the interviews were transcribed verbatim by one of the research team members (TB). Coding of the transcripts and the identification of emerging themes were carried out using a thematic approach as recommended by Nowell et al., (2017).[24] The conceptual mapping of the themes emerging from the data was achieved by careful reading and re reading of transcripts against the research question. The process of coding involved an inductive approach and the common themes were identified by comparing and contrasting the patterns and meanings as expressed by participants. Two researchers (LR and TB) independently read the transcripts, did coding and analysed the qualitative data and these were further checked by another 2 researchers (KK and IT) for accuracy. All team members reviewed the final themes and a consensus was achieved resolving the discrepancies through discussion. A final set of six major themes were identified and the qualitative findings are presented, accordingly. Participants were deidentified throughout the transcription to ensure the confidentiality and anonymity and the pseudonyms (such as MO, UH&FPO, RMO, CS) were used when illustrating participants' voice.

The collection and analysis of data from 15 in-depth interviews adhered to the Standards for Reporting Qualitative Research (SRQR)[25] and strategies were employed to enhance the trustworthiness (credibility, transferability, dependability, confirmability and transferability) of the study findings.[26 27] This included checking the data for accuracy, organising debriefings for completeness of data (KK and IT), using team meeting for coding consensus and providing adequate information about the participants, study settings, and data collection as well as use of direct quotes of the participants to support the findings. See Appendix-A, SRQR Checklist as Supplementary document.

Results

Participants: Participants for the qualitative interviews (N=15) included Upazila health and family planning officers (n=4), resident medical officers (n=6), medical doctors (n=4) and civil surgeons (n=1). Of the 15 participants, 12 were males and 3 were females and their duration of employment ranged from 18 months (for resident medical officers) to the fifteen years (for civil surgeon). All participants, except civil surgeon were based at the UHC, and were responsible for the provision of clinical and preventive health services. Civil surgeon was based at the district hospital and was responsible for the overall management of health service delivery in its' catchment area. Participants for the stakeholder meeting were government health managers and health policy makers working at the Directorate General of Health Services, Ministry of Health and Family Welfare; researchers and academicians from different research institutes and universities; representatives from international and national non-governmental organizations; private health practitioners and representatives of news media.

Participants noted that the burden of NCDs in Bangladesh is increasing rapidly and the government's initiative to establish NCD corners at the UHC level was timely. Participants also highlighted several

challenges including the shortage of human resources, inadequate capacity building in NCD prevention and management, limited supplies of drugs and logistics, and poor monitoring of service delivery and coordination mechanisms. The findings are presented in following themes.

NCDs current scenario: Participants remarked that, in Bangladesh, the burden of NCDs and number of patients experiencing NCD-related problems are increasing rapidly in both urban and rural settings. The most common reasons for patients' visit to NCD corners were diabetes, cardiovascular diseases (CVD) and Chronic Obstructive Pulmonary Disease (COPD), followed by other associated non-communicable conditions such as mental health, cancers and road traffic accidents. Participants noted that, in most cases, patients visit health facilities not knowing that they have developed NCD conditions. As one participant explained:

"*It is somehow difficult to identify patients with NCDs as people do not usually come to treat NCDs. Rather, the patients come with general sickness and sometime even hide or forget to mention symptoms that might help us identify NCD cases.*" *-MO, Ramu UHC, Chittagong*

NCDs service readiness (physical and human resources, equipment, logistics and drugs): Despite the increasing burden of NCDs in Bangladesh, the readiness in terms of access to and utilization of NCD services has remained one of the major challenges. Participants noted that NCD corners have basic equipment required to provide basic NCD services sphygmomanometers, weighing scales, and height measurement boards. Although one NCD corner had a glucometer set available, the supplies in generally inadequate, and in most cases glucometer strips and batteries were out of stock, making the available glucometer test set unusable. As one participant note:

"*BP machine and glucometer set along with other measuring tools are available in our NCD corner. But the problem is that we don't have enough glucose measuring strips.*" *-MO, Munshiganj, Dhaka*

Participants stressed the importance of developing a dedicated NCD team that could provide comprehensive NCD services more effectively. However, they highlighted the challenges associated with running NCD corners, noting that there are no designated positions such as medical officers, paramedics or nurses specifically attached to NCD corners. In general, medical officers and other staff are assigned locally and attached to the health facility in-charge.

"*There is no such team working here at the NCD corner. Only the NCD MO is working for NCD corner. The senior nurse and a paramedic are involved but not dedicated to NCD corner, they are responsible to overall OPD services.*" *-MO Devbhata, Khulna*

Adequate and regular supply of logistic services and drugs is essential for the provision of NCD services. However, participants remarked that logistic services and monthly drug supplies from the district health office were deficient and not actioned on a regular basis.

"*We always try to provide whatever medicines are available at the dispensary, but in most cases, we have a stock-out of NCD drugs, so patients are advised to purchase medicines from the private drug shops.*" *-UH&FPO, Jhikorgacha, Khulna*

In order to supplement information concerning NCDs service readiness, we also collected data using NCD health facility observation checklist **(Table 1).** The findings supplement the expression and concerns shared by participants. All NCD corners had availability of basic equipment, however other essential equipment and supplies were not available. The shortages of laboratory facilities in all UHCs were reported. All UHCs had the MO and paramedics locally assigned. NCD drugs were unavailable in almost all UHCs, except few UHCs of Khulna Division and one UHC of Dhaka division.

Table 1. Service readiness (availability of basic infrastructure, equipment, diagnostic services, supplies and medication)

Physical infrastructure	Khulna division				Dhaka division			Sylhet division		
UHCs code ⇨	1	2	3	4	5	6	7	8	9	10
Basic infrastructure										
Adequate lighting	√	√	√	√	√	√	√	√	√	√
Water and sanitation facilities	√	√	√	√	√	√	√	√	√	√
Space, cleanliness, ventilation	√	√	√	√	√	√	√	√	√	√
Storage facility/ Refrigeration	×	×	×	×	×	×	×	×	×	×
Furniture (patient examination bed, chairs & table)	√	√	√	√	√	√	√	√	√	√
Basic equipment and supplies										
Weighting scale	√	√	√	√	√	√	√	√	√	√
Measuring tape	√	√	√	√	√	√	√	√	√	√
Height measure	√	√	√	√	√	√	√	√	√	√
Stethoscope	√	√	√	√	√	√	√	√	√	√
BP measurement set	√	√	√	√	√	√	√	√	√	√
NCD patient register book	×	×	×	×	×	×	×	×	×	×
Clinical protocol for NCDs	×	×	×	×	×	×	×	×	×	×
NCDs related IEC materials	×	×	×	×	×	×	×	×	×	×
Investigation and laboratory facilities										
Glucometer set	×	×	×	×	×	×	×	×	×	×
ECG set	×	×	×	×	×	×	×	×	×	×
Urine protein test by strips	√*	√	√	√*	√	√*	√	√*	√*	√*
Urine Ketone test by strips	√	√*	√	√	√*	√	√*	√*	√*	√
Blood Cholesterol assay	√	×	√	×	√	×	×	×	×	√
Lipid Profile	√	√	√	×	√	×	√	√	×	√
Serum Creatinine assay	√	×	√	×	×	×	√*	×	×	×
Troponin Test by strips	×	×	×	×	×	×	×	×	×	×
Urine test strips	√	×	√	×	√	×	×	×	×	×
Fasting blood sugar test	√	√*	√	√*	√*	√*	√*	√*	√*	√*
BS 2Hrs ABF	√	√*	√	×	√*	×	√*	×	√*	√*
HbA1c	×	×	×	×	×	×	×	×	×	×
Human resources										
Medical Officer	√	√	√	√	√	√	√	√	√	√
Nurse	√	√	√	√	√	√	√	√	×	√
Others support staff	√	√	√	√	√	×	√	×	√	×
Availability of NCDs drugs										
Metformin	√	√	×	×	√	×	×	×	×	×
Insulin	×	×	×	×	×	×	×	×	×	×
Glibenclamide	×	×	×	×	×	×	×	×	×	×
Amlodipine (Tab. Amdocal)	√	√	×	×	√	×	×	×	×	×
Tab Nifedipine	×	×	×	×	×	×	×	×	×	×
Hydrochlorothiazide	×	√	×	×	×	×	×	×	×	×
Propranolol	×	×	×	×	×	×	×	×	×	×
Atenolol	×	×	×	×	×	×	×	×	×	×
Furosemide	×	×	×	×	×	×	×	×	×	×
Spironolactone	×	×	×	×	×	×	×	×	×	×

* Reagent/ lab technician was not available during the period of data collection; √ denotes availability of services; × denotes unavailability of services

UHC codes = 1: Chowgacha UHC; 2: Zhigorgacha UHC; 3: Kaligong UHC; 4: Devhata UHC; 5: Mushigong UHC; 6: Hazigong UHC; 7: Golapgong UHC; 8: Balagong UHC; 9: Fenchugong UHC; 10: Chatok UHC

NCDs screening, diagnosis, treatment, follow-up and referral: Participants reported that the services available in the NCD corners were limited to general consultation, health education and counselling. Patients with possible NCD problems were advised from the OPD registration booth to visit the NCD corners and to undergo necessary medical investigations when required. Those requiring further attention, were referred to the specialists such as cardiologists, endocrinologists, and pulmonologists. However, in most cases, these specialists were not available in the UHCs. One MO stated:

"*The patients generally receive basic NCD services including consultation, basic investigation, and treatment and advice from us. In case, the case is not manageable or too serious, we refer the patients to the district hospital where the specialists are available.*" *-UH&FPO Teknaf, Chittagong*

Another MO told about the follow-up process:

"*We do not have formal system in place to follow-up the patients, but I always tell the patients for follow-up visit after a certain duration and also I suggest them to bring the old OPD card during the next visit."* *-MO, Munshiganj, Dhaka*

In contrast, another participant mentioned that:

"*Among the patients, who come for follow-up, the diabetes patients are very much aware and regular, but the hypertension patients sometimes miss their appointments for follow-up and also forget to bring their old OPD cards.*" *-RMO, Balaganj, Sylhet*

Record keeping and reporting: During the field data collection, in each NCD corner, we physically inspected if they had a separate registry for NCD patients. We found that most of the NCD corners had no separate registry for record keeping. Only three NCD corners that had had a separate register available for NCD patients shared their concern regarding the duplicate recording and reporting. One participant stated:

"*We do have a separate register for record keeping and reporting for NCD cases. But the problem is the NCD cases are reported both in the regular register book and NCD corner register book, so there is always a risk for duplication in reporting.*" *-RMO, Chowgacha, Khulna*

Challenges to strengthening the NCD services: At systems level: The main concern shared by all UH&FPOs was the lack of proper communication and coordination between respective UHCs and the NCDC unit at DG Health Services when establishing NCD corners and determining NCD services. The gap existed in terms of the availability and the use of standard operating procedure as well as basic logistic services and essentials, the functional modality of NCD corners, human resources management, and monitoring and reporting systems. As participant put it:

"We did receive a letter from the NCDC unit of DG health services last year, suggesting us to establish an NCD corner, however no detailed guidelines, standard operating procedure, logistics and supplies were provided." *-RMO, Balaganj, Sylhet*

"There has not been any supervision and monitoring from the NCDC unit, nor we have communicated with them regarding the NCD corner and its' service delivery mechanism."

-UH&FPO, Jhikorgacha, Khulna

"*We already have human resource crisis, there are not enough paramedics or doctors. Over that the rapid and frequent transfer of the trained NCD corner MO makes it even more challenging to keep the NCD corner fully functional.*" *-UH&FPO, Jhikorgacha Khulna*

At service delivery level: The basic essential medicines which are available for NCDs at UHC were limited to the common NCDs condition such as, diabetes and hypertension. In most cases, the MOs were busy in providing OPD consultations thus, did not have adequate time for providing counselling and health education. At the same time, paramedics in the OPD either did not find enough time or had limited knowledge to provide proper counselling and health education for NCDs prevention and management.

Participants also raised concern about the lack of regular laboratory facilities in the UHCs, which compelled patients to visit private laboratory. One UH&FPO stated:

"... when the lab service is not available at UHC, we have no choice than sending them to the private lab, where the patients are compelled to pay high cost. Even patients sometime do not perform investigation as they can't afford the cost. *-UH&FPO, Munshiganj Dhaka*

Other challenges identified were patients' poor awareness of their own NCD conditions and negligence in bringing previous visits' prescriptions during the follow-up visits. All of these were the added challenges for the MO working in the NCD corner. One RMO expressed:

"*People are not even aware that they need to bring their past prescriptions during the follow-up visit, that makes MO's job even harder for proper investigation, diagnosis and quality care.*"

-RMO, Chowgacha, Khulna

Perceived solutions to addressing the NCDs challenges: Participants in the qualitative interviews and a stakeholder meeting identified several challenges and suggested several possible measures to address them. Few majors of them are as below:

(i) Communication and coordination: All participants recommended the needs for effective communication and coordination between respective UHCs and the NCDC unit of DG Health Services.

(ii) Infrastructure, logistics, equipment and medicine: Participants identified the needs for adequate physical infrastructure, essential equipment such as glucometer, strips for random blood glucose test, ECG machine and batteries to operate the equipment. Furthermore, a need for regular supply of NCD medicines, and having availability of the IEC and BCC materials was suggested.

(iii) Trained human resources: Participants strongly recommended a need for a dedicated NCD corner team, which may comprise a trained MO, paramedics such as Medical Assistant, a Nurse and a supporting staff.

Discussion

This study provided an overview on the current status of NCD corners and highlighted the challenges and opportunities to strengthen the NCD services provided through the NCD corners in Bangladesh. Given the increasing burden of NCDs in the country, there has been a greater need for developing a feasible mechanism that addresses the problems of NCDs, meets the service delivery needs, and ensures the services are provided at the grassroot level with affordable cost. The initiative taken by the Bangladesh government to establish NCD corners in UHCs is vital to prevention and control of NCDs. The findings of this study describe the current challenges that NCD corners are facing, which should guide the policy makers to take measures in strengthening NCD services, delivered through NCD corners.

NCDs current scenario: The findings related to the common NCD problems such as CVD, diabetes, and COPD corroborate existing literature. The World Health Organisation (WHO) that over two-third (67%) or estimated 550,000 people in Bangladesh die every year due to NCDs and related conditions including CVD, diabetes, COPD, cancer and mental health problems.[28] Over the past 20 years, there has been a nine fold increase of deaths from the NCDs[29] and this is likely to increase if no appropriate actions are taken seriously.[3 8 16]

Service readiness: We identified the lack of service readiness to address the problem of NCDs at the primary care level. The shortages of trained health care providers align with the overall shortages of trained HRH in Bangladesh, particularly in rural areas.[30-32] This shortages of trained human resources does not meet the WHO recommended ratio or health care providers (1: 3: 5) for providing basic health care at the primary care level.[33] The trained health care providers play a vital role in the efforts of prevention and control of NCDs.[32] A recently conducted multi-country study in selected countries of Asia and Pacific reported that the community health workers (CHWs) play a key role in the delivery of health services, and capitalizing on their experiences could deliver more NCD-related services. Further, the study emphasized a need for building the capacity of CHWs to deliver quality NCD-related services.[32] Studies in sub-Saharan Africa have reported that poor knowledge and experience of front-line health workers were major barriers to care and services for NCDs.[34 35]

Alternatively, studies in selected countries of Africa[36 37] and Asia[38 39] have established proper training and supervision of non-medical-doctor clinicians or nurse-led clinics could provide effective primary care for NCDs. However, in the context of Bangladesh, such provisions of task-shifting for NCDs services for non-medical health workforce is still unavailable.[39] Studies reported lack of different aspects of care at UHC [6 7 40], which range from basic equipment to logistics, supplies, diagnostic services, medicines and specialized care, recording, reporting and referral. Study also identified lack of/poor quality of medicines as cause of patient dissatisfaction in government health facilities in Bangladesh. A study in India reported discordance in availability of recommended class of drug for CVDs at primary health care levels.[41]

NCD services: The findings of this study show that the NCD corners currently lack the facilities and equipment essential for NCDs screening and early diagnosis. NCDs early screening and diagnosis are crucial to the NCDs prevention and control efforts, particularly in countries like Bangladesh, where the cost of treatment and medication are so expensive that most of the people could not afford these services. These findings corroborate to the findings of a study conducted in a low resource neighbouring country, Nepal.[42] Mishra et. al., reported that lack of infrastructure, basic supplies, equipment and mechanism are major issues to combat issues of NCDs at primary health care levels in Nepal. People with NCDs often travel to the secondary or tertiary level hospitals, generally located in urban areas and using the NCD services from these urban hospitals is often geographically inaccessible with high cost.

Challenges to NCD service strengthening: The findings of this study also highlighted some key challenges that exist at systems and service delivery levels. Other studies in Bangladesh suggested that the health systems of Bangladesh are not yet well prepared to combat problem of NCDs.[7 20 43] For example, Roman et. al, (2015) using a scorecard for tracking actions to NCDs, reported low performance scores in three out of four domains of score card including risk factor surveillance, research, and health system response, and the governance component received moderate performance scores.[43] Similarly, Bangladesh Health Watch Report 2016, documented that government's role has been very limited to providing NCDs and related services to combat the growing burden of NCDs in Bangladesh.[7 17] However, developing a functional team and a service delivery system in resource poor setting is possible and has been highlighted by several studies but needs to be translated into action.[32 44]

Limitations: One of the key limitations of this study was, we were unable to include beyond four administrative divisions. Having additional sub-districts included in this study could have added additional insights to make the findings more generalizable. However, we believe that our findings are generalizable considering that the results are consistent with other studies in Bangladesh. Further, we were unable to collect data from the patients, which could have added insights from the service recipients' perspective but was out of the scope of this study.

Conclusion: The findings provide current insights about the situation and the challenges faced by NCD corners located in different UHCs across four divisions in Bangladesh. The findings suggest that

the NCD corners remain poorly functioning with many challenges at systems and service delivery levels. These include (a) lack of trained human resources, (b) inadequate equipment and laboratory facilities, (c) inadequate logistics and drug supplies, (d) lack of proper recording and reporting, (e) coordination/ communication between NCD corners and NCDC unit of DG health services and (f) lack of proper guidelines and standard operating procedure.

Although, the NCD corners are still at a nascent stage, there are needs to improve capacity of NCD corners to screen for NCDs and facilitate the subsequent investigation, treatment, referral, recording & reporting and follow-up. These will require upgrading of physical infrastructure, ensure supply of basic equipment and logistics, availability of trained human resources team for NCD corner, and ensure proper communication and coordination between NCD control unit of DG health services and respective UHCs, along with expert advice for long-term systems strengthening. All these findings need to be taken into consideration prior to expanding these NCD corners to other UHCs.

Consent to publish: Not applicable. The manuscript does not include details, images, or videos relating to an individual person.

Patient consent for publication: Not applicable.

Contributors: LR, KK, TB, MIT, and SMA contributed conceptualizing the study, drafting the manuscript and finalization. LR, TB and MIT contributed in data analyses and results write up. PP, ASA, AMNR, SMSI, KK, and SMA thoroughly reviewed the manuscript and contributed substantially for necessary revision. LR, KK, TB, ASA, AMNR and SMA final reviewed the manuscript and prepared for submission.

Funding: This study received seed funding support from the Centre of Excellence for Universal Health Coverage (CoE-UHC), BRAC University, Bangladesh.

Competing interests: All authors declare no competing interest.

Availability of data and materials: The qualitative data used and analysed in this study can be available from the corresponding author on reasonable request.

Figure Title and Legend:

Figure 1: Flow chart describing sampling strategy and data collection process in the study.

NCD: non-communicable disease; UHC: upazila health complex; NCDC unit: NCD control unit; DG: director general of health services; KII: key informant interviews

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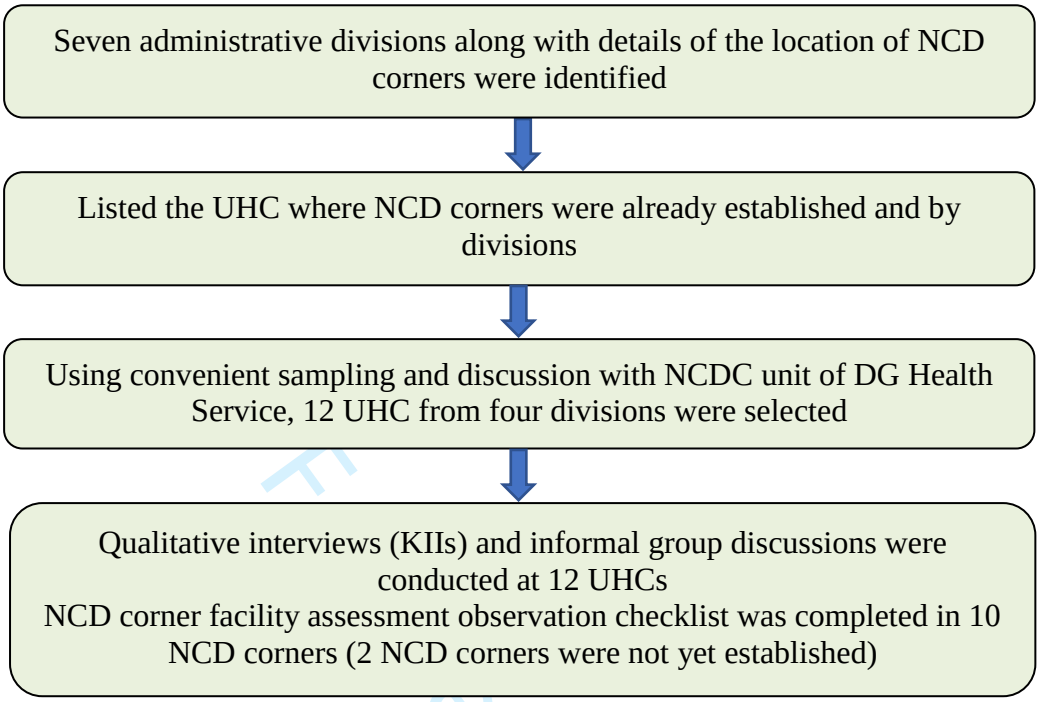

Appendix A

Standard Reporting for Qualitative Research (SRQR) Checklist for the study entitled "Non-communicable disease (NCD) corners in public sector health facilities in Bangladesh: Challenges and opportunities for improving NCD services at the primary health care level"

	Standards for Reporting Qualitative Research (SRQR)*	Page/ line no.(s)
Title and abstract		
	Title - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended	P1, lines 1 - 3
	Abstract - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions	P1
Introduction		
	Problem formulation - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	P2, lines 29-39 and P3, lines 1-16
	Purpose or research question - Purpose of the study and specific objectives or questions	P3, lines 16-19
Methods		
	Qualitative approach and research paradigm - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**	P3, lines 27-39
	Researcher characteristics and reflexivity - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability	P4, 27-37
	Context - Setting/site and salient contextual factors; rationale**	P3, lines 22-26
	Sampling strategy - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**	P4, lines 1-9
	Ethical issues pertaining to human subjects - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	P4, lines 18-22

Data collection methods - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**	P4 lines 23-37
Data collection instruments and technologies - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study	P4 lines 10-17
Units of study - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	P5, lines 25-27
Data processing - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts	P5, lines 2-8
Data analysis - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale**	P5, lines 8-14
Techniques to enhance trustworthiness - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale**	P5, lines 15-22
Results/findings	
Synthesis and interpretation - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	P5, lines 25-38, P6, lines 1-10; 15-21; 25-29 P7, lines- 1-3; 8-13; P9, lines 1-6; 21-25; 34-36; P10, lines 13-18; 25-27; 32-34
Links to empirical data - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	P6, lines 13-15; 24-25; 32-34 P7, lines- 4-6 P9, lines 7-19; 26-28 P10, lines 1-11; 21-23; 28-29
Discussion	
Integration with prior work, implications, transferability, and contribution(s) to the field - Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field	P11, lines 13-28 P12, lines 1-29 P13, lines 1-12
Limitations - Trustworthiness and limitations of findings	P12, lines 31-36
Other	

	Conflicts of interest - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	P14, line 1
	Funding - Sources of funding and other support; role of funders in data collection, interpretation, and reporting	P13, lines 22-23
	*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.	
	**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.	

Reference

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. **Standards for reporting qualitative research: a synthesis of recommendations.** *Academic Medicine*, Vol. 89, No. 9 / Sept 2014, DOI: 10.1097/ACM.0000000000000388