

Readiness of Health Professionals, Undergraduate Medical Curriculum and on-the-job Training on Non-communicable Diseases in Bangladesh to achieve Program Objectives- an Operational Research Study

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Abstract:

Health professionals need competency in the assessment and outcome evaluation of several health behaviors related to NCDs and their risk factors. Assessment of the curricula in health professional education programs with respect to health promotion competencies is a compelling and potentially cost-effective initial means of preventing and reversing the trend of non-communicable diseases. Learning evidence-based health promotion competencies within an inter-professional context would help students maximize the use of non-pharmacologic/non-surgical approaches and the contribution of each member of the health team.

This operational research study was initiated by Non-communicable Disease Control Program (NCDC) of GOB to assess the readiness of the medical graduates to achieve the primary program objective “to reduce premature (40-69 years age group) death by 33% by the year 2030”. The program also wanted to review the existing undergraduate curriculum

to determine the need for a change to achieve program objectives. The activity was delegated to Bangladesh College of Physicians & Surgeons (BCPS), to develop the recommendations for the NCD program. The study was designed as a cross-sectional mixed-method study adopting both quantitative and qualitative methods. Quantitative data were obtained from new graduates (12 medical colleges’ public & private) and older graduates from the existing public healthcare services. In-depth interviews (IDI), Key informant interviews (KII) & opinion gathering workshops were adopted to collect qualitative data. Senior medical teachers teaching NCD subjects were included in the qualitative process. Quantitative data were analyzed by using SPSS 20.0. Qualitative data was audio-recorded and transcribed by the anthropologist team. The curriculum review was done manually by using content analysis of the whole curriculum.

The total number of respondents for the quantitative survey was 678, new graduates 348 (51%), older graduates 330 (49%). Among older graduates, 178 (54%) had no previous training, and 152 (46%) received some form of on-the-job training on NCDs by the program. The 12 IDI, 7 KII and 4 workshops participated by 88 senior teachers participated in recommendations development. The knowledge of 4 major NCDs, four major risk factors, PEN, and contribution of death from major NCDs was incorrect, suggesting a lack of conceptual and contextual understanding of the NCD prevention and control program. Qualitative investigation & opinion of the teachers suggested a lack of awareness of teachers regarding the control program, revealing a lack of communication and co-ordination between the program and academia, and the present curriculum is inadequate for NCD learning by the students.

It can be concluded that the existing curriculum is inadequate in terms of program orientation and necessary skills to achieve the program objectives. A structured training program using a training module covering the concept and content on prevention and control of NCDs in a country perspective is essential for the current graduates. Major NCD education in the existing curriculum requires to be urgently updated and could be best offered by using a teaching-learning module on major NCDs.

Keywords: PEN, Non-communicable diseases control program (NCDC), MBBS Curriculum, KII, IDI, Workshops, Doctors, Bangladesh

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Introduction:

The UN High-Level Meeting on Non-Communicable Diseases (NCDs) in September 2011 is an unprecedented opportunity to create a sustained global movement against premature death and preventable morbidity and disability from NCDs, mainly heart disease, stroke, cancer, diabetes, and chronic respiratory disease.¹ The increasing global crisis in NCDs is a barrier to development goals, including poverty reduction, health equity, economic stability, and human security.¹ Non-communicable diseases (NCDs), including heart disease, stroke, cancer, diabetes and chronic lung disease, are collectively responsible for almost 71% of all deaths worldwide.² Almost three quarters of all NCD deaths, and 82% of the 16 million people who died prematurely, occur in low- and middle-income countries.² The Lancet NCD Action Group and the NCD Alliance propose five overarching priority actions for the response to the crisis—leadership, prevention, treatment, international cooperation, and monitoring and accountability—and the delivery of five priority interventions—tobacco control, salt reduction, improved diets and physical activity, reduction in hazardous alcohol intake, and essential drugs and technologies.¹ The priority interventions were chosen for their health effects, cost-effectiveness, low costs of implementation, and political and financial feasibility.¹ Overall, scaling up of NCD health promotion activities through behavior change communication (BCC), increasing capacity of service providers to treat NCDs in rural health centers, and more government financial support for researchers in the field of NCDs was identified as three major challenges.³ Although non-communicable diseases (NCDs) have been described as being largely preventable, priorities for action based on the foundation value of health promotion from the Ottawa Charter remain to be fully implemented.⁴ These include strengthening structures and processes for health promotion, moving toward knowledge-based practice, and building a competent health promotion workforce through professional education that is responsive to societal priorities.⁴

The healthcare system in Bangladesh traditionally focused on the provision of acute care to patients with communicable diseases, which generally involves diagnosis, treatment, and discharge of patients to the

community. The healthcare needs of people with NCDs require a different approach as they need treatment for an extended period and cannot usually be discharged from the treatment plan.⁵ To increase the global impact of health promotion related to non-communicable diseases, health professionals need evidence-based core competencies in health assessment and lifestyle behavior change.⁴ Assessment of health promotion curricula by health professional programs could be the first step. Such program assessment is a means of 1) demonstrating collective commitment across health professionals to prevent non-communicable diseases; 2) addressing the knowledge translation gap between what is known about non-communicable diseases and their risk factors consistent with ‘best’ practice; and 3) establishing core health-based competencies in the entry-level curricula of established health professions.⁴

Based on recent reports in *The Lancet* and the WHO, health professionals continue to practice largely in silos.^{6,7} They have focused largely on the unique competencies that define them professionally and limited competencies that could be performed by others. Inter-professional health service delivery, including shared goals, is being strongly advocated. Inter-professional health service delivery is hallmarked by a commitment to evidence-based practice and commonalities of approaches to service delivery.⁴ No benchmarks exist for health promotion content in the entry-level health professional education curricula.⁴ Most health professions are committed to evidence-based practice, including knowledge translation and integration. The elements of evidence-based health promotion competencies include a process for assessment and intervention that is common across health professionals, thus facilitating the integration and implementation of such clinically relevant tools into their practices.

Factors that inform contemporary health professional curricula have not been well described. Much of the content of journals on education in the health professions focus on pedagogical issues, e-learning, and technology rather than examining how curriculum content should be established based on epidemiological, social, and economic considerations and how curricula should respond to changing epidemiological trends. The content of health professional education curricula appears to reflect historic precedent rather than being informed by a coherent rationale based on epidemiology

and societal priority. To make the point, if these curricula were to be designed for the first time today, in the current health climate, they are likely to look very different. The aim of this study was to assess the readiness of medical graduates to provide NCD care at the PHC level and develop recommendations for updating curriculum content for NCD care in the existing medical curriculum.

Methodology:

This activity was designed as a mixed method study consisting of both quantitative and qualitative approach to assess the readiness of medical graduates, and reviewing the existing undergraduate medical curriculum (2012) for NCD related teaching-learning content and processes. Sufficient references were not available to decide on the methodology of the study to draw the intended conclusions. We extensively reviewed the literature to derive a feasible methodology for the mixed method study. The readiness assessment consisted of collecting quantitative data on the knowledge, attitude and practice (KAP) of the medical graduates (new & older) using a self-administered, multiple-choice, close-ended, structured questionnaire with few 'fill in the blanks' questions. The curriculum review consisted of a quantitative description of the contents in all NCD content related subjects (Physiology, Biochemistry, Community Medicine, Pharmacology, Pathology, Medicine and Surgery) and also reviewed last 5 years written assessment questions in different professional examinations of those subjects. The qualitative method was applied to explore the perceived knowledge, barrier, challenges, and opportunities in providing NCDs care from the medical graduates and senior medical teachers and gathering opinion for developing the recommendations for improving NCD care at the PHC level.

The quantitative KAP survey data were collected from new medical graduates who are undergoing internship training and older medical graduates (currently working in Primary Health Care (PHC) setup of GOB). The newer graduates were placed in Medicine wards at the time of data collection. The older graduates were recruited from 57 out of 64 districts of Bangladesh, who were invited attending training program in Dhaka on "NCD prevention & control". The trainees were selected arbitrarily from Upazilla Health Complexes (UHC) by the program and the KAP questionnaire was applied as a pre-test before the sessions. The newer graduates were purposively recruited from 12 relatively older and reputed medical colleges out of which 6 colleges were Government and 6 were private. The questionnaire was

structured, close ended and developed by the research team after a series of discussions. It contained Apart from the socio-demographic data, there were 53 questions regarding NCD, risk factors, burden, WHO-PEN, and NCD related topic in the MBBS curriculum to assess knowledge, attitude and practice. Data were collected by trained Research Assistants (RAs).

In the quantitative part, the calculation of the sample size was based upon an estimation of the prevalence of standard knowledge base about NCD management. Based upon the target population medical graduates (about 5000 new graduates each year in the country), a standard knowledge-based prevalence estimate of 50%, with 95% confidence and a random sampling error of 5%, the sample size was calculated to be 341 for each of new and older graduates. Because of time constraints, we couldn't randomize medical colleges, but purposively chosen easy accessible relatively older medical colleges, as all the medical colleges are using the same curriculum and there was no intention of comparison between groups. The quantitative part of the curriculum review consisted of thoroughly reviewing every page of the Bangladesh Undergraduate medical curriculum 2012, which is followed in all (~110) medical colleges of Bangladesh. The review was done by 3 of the co-investigators. The findings were described by subject, by teaching hours & by the teaching methods. Written questions of 1st professional to final professional examination of the last five years were reviewed by the group for quantifying the assessment questions on major NCDs by subject.

The qualitative component consisted of 12 IDI (Intern doctors), 7 KII (Professors in Medical Colleges) and 4 workshops (attended by medical teachers, administrative personnel & policy makers). The qualitative research methods used for this study included purposive sampling, open-ended interviewing, and systematic and concurrent data collection and data analysis procedures. Specifically, the grounded theory or constant comparative method was used to analyze the data and discover the meaning of NCD prevention and control. All interviews with key informants were conducted by a team of anthropologists led by a senior Anthropologist using structured protocols tailored to each key informant category. The key informant participation was voluntary and audio recorded, all informants consented to these ground rules. We employed a careful and rigorous process of informant selection to ensure that all opinions of key stakeholders

were considered.

The interview transcripts were reviewed several times, searching for “recurring regularities. The interviewer highlighted quotes and phrases from the interviews that were significant to the study. Using the constant comparative method went back and forth among transcripts until categories emerged that were consistent, yet distinct. These categories, coded the transcripts, and placed sections in labeled folders representing each. We brought together the coded interviews and field notes and looked for relationships within and across the data sources. A table was developed to compare various coded interviews. As tentative categories emerged, the researcher tested them against the data. We integrated and refined the categories until themes solidified. We try to decrease threats to credibility (quantitative researchers would use the term internal validity) by triangulating data.

Data were entered using Microsoft Excel book on a pre-developed data screen. Data were analyzed using SPSS 20.0. The analysis was descriptive only showing percentages. Correct answers were identified by the Research coordinator as per the answer key provided by the research team. Ethical clearance was obtained from the Ethical Review Committee of Bangladesh College of Physicians and Surgeons (BCPS).

After a presentation of key findings from quantitative data, curriculum review findings and qualitative findings, opinion was sought on 12 pre-determined questions through workshops. The workshop participants discussed freely on each of the questions and the whole session was audio-recorded. The principal investigator acted as the moderator of the

workshops and the members of the research team further facilitated the discussions. The anthropologist team was present for qualitative analysis of the discussions. Final recommendations were developed in the last workshop.

Results:

The total number of respondents for the quantitative survey was 678, response rate (97%), new graduates 348 (51%), older graduates 330 (49%). Among the older graduates, 178 (54%) had no previous training and 152 (46%) received some form of on the job training on NCD by the program. The older graduates represented 61 out of 64 districts of Bangladesh by their current posting place. The frequency of the respondents from private and public Medical Colleges were almost equal among the new graduates, but respondents from private medical colleges were lower among the older graduates (Fig-1). The year of graduation of the were 1 to 35 years, the highest proportion being between 6-10 years.

Regarding NCDC program, about 52% of the respondents perceived their education on NCDs as adequate and was similar in all 3 groups. The correct answers regarding names of 4 major NCDs and 4 major risk factors were 1% and 11% respectively. The correct response to ‘deaths from NCD were more than infectious diseases’ was 80%, correct response to proportion of deaths from NCD was 21%. About 10% of the respondents admitted that they have been taught about “WHO PEN” and about 20% could mention the full meaning of PEN. Recommended age for screening NCDs & counseling on healthy behaviors could be correctly answered by about 30%. The correct response rate did not differ whether or not the older graduates received

Table-I

<i>Program related Knowledge</i>				
Questions	Total#678 Older N (%)	Graduate (with NCD Training) N=152 (%)	Older Graduate (No NCD Training) N=178 (%)	New Graduate N=348 (%)
Taught the importance of NCD surveillance and the role of Doctors in it	351 (52)	80 (53)	88 (50)	183 (53)
Name of 4 major Non-communicable Diseases	7 (1)	4 (3)	3 (2)	0 (0)
Name of 4 main behavioral risk factors for major NCDS	76 (11)	19 (13)	24 (14)	33 (10)
Estimated percentage of death by NCDs in Bangladesh	143 (21)	41 (27)	33 (19)	69 (20)
Burden of NCDs in Bangladesh is greater than those of infectious diseases	541 (80)	138 (91)	149 (84)	254 (73)
Taught on The WHO ‘PEN’ for primary care	66 (10)	8 (5)	13 (7)	45 (13)
‘PEN’ full meaning	134 (20)	33 (22)	37 (21)	64 (18)
Recommended age for screening NCDs & counseling on healthy behaviors	201 (30)	58 (38)	64 (36)	79 (23)

training on NCDC program (Table-1).

About 32% respondents heard about 'The total risk approach' using a score chart to calculate risk of heart attack or stroke, and about 15% used the WHO/ISH Risk prediction chart (Risk calculator). The correct responses for 'cut off Systolic and diastolic pressure for urgent referral for hypertension' was about 23%, the 'goal BP in a case of clinical Cardiovascular Disease (CVD)' was about 1%, 'Drug of choice for hypertension in a diabetic' was about 64% and 'Drug treatment recommended with BP >140 / 90 mmHg after life style modification for 6 months' was about 69% (Table-2). The correct response rate did not differ between different groups of respondents.

The frequency of correct answers on attitude towards NCD prevention & Management were- 'Legal

interventions to prevent & control of NCDs is important' (76%), 'Non-health sectors in the prevention and control of NCDs is important' (67%), 'Doctors can efficiently contribute to reduce NCD burden with preventive action' (60%), 'Doctors can't contribute in NCD prevention as overburdened with management of other patients' (9%) and 'Providing health promotion in addition to medical care is the responsibility of a doctor' (40%) (Table-3). The frequency of correct answers related to current practice of NCD prevention & Control were- 'Advising patients with NCDs on changing their habits /life styles' (65%), 'Advising family members of patients with NCDs about measures taken' (53%), 'Advising family members to avoid getting NCDs' (52%), 'Advising patients coming for other diseases but having risk factors on changing their habits /life styles' (58%), and 'Advising patients not diagnosed with NCD on NCD screening

Table-II

<i>Cardiovascular Diseases related Knowledge</i>				
Questions	Total#678 N (%)	Older Graduate with NCD Training) N=152 (%)	Older Graduate (No NCD N=178 (%)	New Graduate N=348 (%)
Taught on 'The total risk approach' using a simple score chart to calculate risk of heart attack or stroke	219 (32)	54(36)	55(31)	110(32)
Used WHO/ISH Risk prediction chart (Risk calculator)	102 (15)	16 (11)	30 (17)	56 (16)
Systolic and diastolic pressure for urgent referral for hypertension	157 (23)	43 (28)	54 (30)	60 (17)
Drug treatment recommended with BP >140 / 90 mmHg after life style modification 6m	468 (69)	121 (80)	146 (82)	201 (58)
Drug of choice for hypertension in a diabetic with BP ≥140 / 90 mmHg	433 (64)	113 (74)	128 (72)	192 (55)
The goal BP for a case of clinical Cardiovascular Disease (CVD)	5 (0.7)	1 (0.66)	3 (2)	1 (0.3)

Table-III

<i>Attitude towards NCD prevention & Management</i>				
Questions	Total#678 N (%)	Older Graduate with NCD Training) N=152 (%)	Older Graduate (No NCD N=178 (%)	New Graduate N=348 (%)
Legal interventions to prevent & control of NCDs is important	512 (76)	128 (84)	140 (79)	244 (70)
Non-health sectors in the prevention and control of NCDs is important	452 (67)	122 (80)	133 (75)	197 (57)
Doctors can efficiently contribute to reduce NCD burden with preventive action	408 (60)	106 (70)	105 (59)	197 (57)
Doctors can't contribute in NCD prevention as overburdened with management of other patients	62 (9)	12 (8)	15 (8)	35 (10)
Providing health promotion in addition to medical care is the responsibility of a doctor	269 (40)	78 (51)	80 (45)	111 (32)

services' (43%) (Table-4).

The qualitative findings are briefly described here because of space limitations. The opinions were sought on "Readiness of medical graduates for providing NCD care including emergencies at PHC level", "Review of the existing medical curriculum for contents on NCD prevention and control in line with program requirements". Data and Methodological Triangulation were done between-methods to integrate insights from quantitative and qualitative data sources'. The participants viewed alarming rise in the number of NCD cases, the lack of proper understanding and adoption of poor lifestyle by people and poor compliance for follow-up after initial treatment. Many of the new and older graduates had understanding and knowledge on NCD prevention and treatment, as well as the risk factors of NCD. However, they often lack confidence in treating, since many new graduates, especially from private medical colleges are not well exposed to patients. The discussants of the workshop stated that doctors at field level are not competent enough to implement the activities of the National Preventive Program. There is a lack of modern equipment or poor resource mobilization in the periphery or rural areas across Bangladesh, where they are needed the most. Many participants said that recently graduated doctors have potentiality, but they are not competent. They need training to implement the activities of national preventive program as well as communication with patients. The discussants emphasized the need for changing the mindset of doctors for adapting to efficient and up to date techniques of treating NCD patients, and observed the medical graduates lacked enough practical exposure to treat NCD patients and their learning was more focused on clearing exams than learning to provide quality care to patients.

The existing curriculum content is not sufficient for successful implementation NCD program; doctors' role in prevention of NCD is not included in curriculum. There is no special allocated time to teach prevention. The subject Community medicine should about team building, leadership, health ethics, communication skill and behavioral science. Inter-profession education might be the best way for team building. Patient education, motivation and compliance could be taught in community medicine also. Current teaching method

can be called "Shallow learning" discussed by senior participants and little scope for "Deep learning". Student lack in basics and their knowledge of medical science do not sustain. Curriculum is focused theoretically rather than practical implications. We have to incorporate more problem based learning/integrated teaching/knowledge sharing in the curriculum. Teachers' delivery of contents in the class and assessment of students is not integrated. Patient education and the teaching of prevention program are also inadequate in the present curriculum.

The curriculum review shows the distribution of allocated total hours for different NCDs in whole curriculum. Total hours of the selected NCDs in the curriculum are 511 hours. Among the total, CAD occupied the longest hours (171 hr) and the after that cancer had the longest allocated hours. The subject wise total hour allocation for NCDs in MBBS curriculum includes, Physiology 119 hours and the subject Medicine had 113 hours in the MBBS curriculum. The Gynaecology & Obstetrics curriculum had the lowest hours i.e. 14 hours on NCDs.

The distribution of allocated hours for different NCDs in each subject showed, in Physiology, CAD occupied 58 hours, while in Biochemistry, DM had 51 hours (Table-11). The use of allocated total hours for NCDs in different teaching methods in whole curriculum showed, Lectures occupied 223 hours in all the selected topics and Practical and Tutorials were only 55 hours (Table-5). The subject wise distribution of allocated hours for NCDs in different teaching methods showed, Clinical in Medicine occupied the highest (80 hours) time in the curriculum among all the subjects. Tutorial and lecture on Physiology had total 45 hours and 43 hours respectively. The subject-wise marks allocation for major NCDs in written component of different professional examinations through five year question evaluation revealed physiology allocated about 67% mark in the selected 'major NCD's. Pathology allocated 41% marks in written component and pharmacology allocated 31% marks. However, Community medicine allocated only 2% marks in written components (Table-6).

The recommendations came out of the opinion gathering workshops went beyond recommendations for NCDs and expressed a wider opinion on the functioning of the whole curriculum. We captured the following key

Table-V*Subject wise distribution of allocated hours for NCDs in different teaching methods*

Subject	Hours distribution in different teaching method				
	Total	Lecture	Tutorial	Practical	Clinical
Physiology	119	43	45	28	3
Biochemistry	76	35	23	18	-
Com. Medicine	32	12	20	-	-
Pharmacology	60	30	30	-	-
Pathology	72	31	32	9	-
Medicine	113	33	-	-	80
Surgery	25	25	-	-	-
Gynae&Obs	14	14	-	-	-
Total	511	223	150	55	83

Table-VI*Subject-wise marks allocation for major NCDs in written component of different professional examinations: Five year question evaluation*

Subjects	Marks allocation for major NCDS						Total
	DM	COPD	Cancer	Stroke	HTN	CAD/MI	
Physiology	7%	34%		7%	19%		67%
Biochemistry	5%	22%					28%
Com. Medicine	1%				.5%		2%
Pharmacology	5%	9%			17%		31%
Pathology	6%		30%			5%	41%
Medicine	4%	3%	2%	4%	3%	4%	20%
Surgery			18%				18%
Gynae&Obs	7%		13%			4%	24%

recommendations widely agreed by the participants and fully agreed by the research team of BCPS.

- All medical graduates (new & older) should receive well-structured training on the prevention and control of major NCDs using a training module incorporating the concept, goals, target, and total cardiovascular approach of the NCDC program.
- All teachers of the Medical Colleges should be trained /oriented regarding the concept, goals, and targets of the NCDC program. Co-ordination between the program and academia should be improved through regular/continued communication.
- Undergraduate Medical Curriculum should be updated, incorporating integrated teaching, and preventing the overload by emphasizing core competencies (Competency-based curriculum). The integrated teaching activity in the present curriculum should include the major NCDs, and the integrated teaching sessions should be conducted regularly in the short term.
- Academic discipline should be enforced in medical colleges for both the teachers and medical students with immediate effect. Reward and punishment should be appropriately applied for bringing accountability for the teachers and the medical students.
- Professionalism in the assessment system should

be enforced to prevent unethical practices by students and assessors.

6. Teaching methods should be modified & updated to facilitate the use of integrated teaching, Problem based Learning & use of teaching-learning modules to better prepare the students for applied learning.
7. The concept of communication skills, ethical principles, professionalism, leadership, and team approach of delivering health care should be emphasized. The allocated hours for teaching and assessment on NCDs should be increased in the subject of Community Medicine. It is urgent to reform the teaching and assessment system in the undergraduate medical curriculum in Bangladesh.

Discussion:

Incorporating the results from the qualitative and quantitative components of the study, the review of the existing curriculum and opinion of the senior medical teachers, the study concludes that the medical graduates are not prepared enough to implement the program directed care for the major NCDs at the PHC level. The existing undergraduate medical curriculum should be urgently updated to implement NCDC program objectives in terms of teaching methods (teaching hours are adequate), e.g., using a teaching-learning module for teaching major NCDs. Community Medicine subject should provide more emphasis both in terms of teaching hours and teaching methods and assessment on major NCDs. Training of all doctors using a structured training module incorporating the concepts and target-oriented contents for the NCD prevention and control program should be a priority action for the program.

This unique operational research study initiated by the National NCDC program and implemented by BCPS involved a team of researchers from BCPS fellows and nationally reputed medical education experts. The development of its methods and the questionnaire presented many challenges. One hurdle was designing a new KAP questionnaire with few previous examples upon which to base our work, as little has been published with regards to NCDs and KAP surveys, especially those designed or implemented in low and middle-income countries and for the medical graduates. This issue could be addressed by the multi-disciplinary working research group, which included epidemiologists, policy analysts,

psychologists, and medical teachers, and educationists. This diversity allowed us to bring skills and experience from a range of backgrounds to more efficiently create a rigorous NCD KAP survey. The research team borrowed assessment tools from Audit and KAP surveys in other fields. The multidisciplinary team working on designing and implementing this survey met every week for face-to-face discussion in addition to sharing ideas by e-mail in between. All this feedbacks were then summarized and disseminated in the second round of discussion by all involved. Once agreed upon, the decisions could be implemented efficiently. The facilitator principal investigator ensured that the process was inclusive and transparent. The timing was also very limited, and a series of delays resulted in rapidly closing the implementation window. The leadership and support of the research team, the National NCDC program, and the BCPS fellow teachers in different medical colleges were essential and allowed for all data to be collected within just two months.

The knowledge of 4 major NCDs, four major risk factors, and contribution of death from major NCDs was incorrect, suggesting a lack of conceptual and contextual understanding of the NCD prevention and control program. Qualitative investigation & opinion of the teachers suggested a lack of awareness of teachers regarding the control program, revealing a lack of communication and coordination between the program and academia in Bangladesh. The NCDC program is unlikely to achieve its objectives unless the team leader (medical graduate) at the PHC level to deliver NCD services is taught and trained in the curriculum on prevention and control of major NCDs. The older graduates who received earlier training on NCD were inefficient in improving their knowledge and understanding of the prevention and control, suggesting poorly structured training conducted by the program in the past. Regarding the perception of medical graduates on adequate teaching in the curriculum, the majority of the respondents considered the teaching was adequate regarding the requirement of long-term care and the importance of surveillance of NCDs. It appears that they may have disease-specific knowledge of management of NCDs though not well aware of the major NCDs and their risk factors. However, about half of them perceived that they were taught insignificantly or not taught adequately, reflecting a lack of program

awareness of the teachers and hence not highlighting the importance of major NCDs.

The most important tool for prevention and control of NCDs being used by the program at the PHC level is known as Package of Essential Non-Communicable Disease (abbreviated as PEN or WHO-PEN) services.⁹ The knowledge, components, and interpretation of the PEN package was only around 20%, suggesting a lack of program orientation in the existing curriculum, and again previous training on NCD could not improve awareness. Coordination between the program and academia and teaching-learning module-based teaching on NCD prevention and control in undergraduate medical curriculum is essential to improve program objectives. The medical graduates have shown adequate knowledge of the diagnostic criteria for hypertension and the need for pharmacotherapy, though the referral criteria for hypertension appeared inadequate (Table-5). However, the knowledge of 'Goal BP' in clinical CVD, knowledge of cardiovascular risk assessment, use of risk chart (WHO-ISH) is grossly inadequate, suggesting poor curricular content & teaching in the undergraduate medical curriculum (Table-6).

The knowledge of medical graduates on the risk factors of COPD in Bangladesh and differentiating asthma from COPD was inadequate, suggesting a lack of applied knowledge and must be due to poor goal-directed teaching. Similarly, the "Goal HbA1c" is not known to >95% of the respondents, another example of poor goal-directed teaching. However, the knowledge of diagnostic criteria of DM was found to be adequate (Table-8). Cancer-related knowledge by the questions we assessed appeared adequate, though the epidemiological knowledge on cancer from a country perspective appeared inadequate (Table-9). The majority of the respondents believe that they have been taught adequately on a healthy diet, vegetable consumption & physical activity in their curriculum (Table 2). But when specifically asked about unhealthy fats, recommended daily salt intake, foods high in salt, recommended fruit and vegetable consumption per day, respondents have very poor knowledge of the specific facts (Table-10). This finding suggests that the respondents are unable to counsel specifically on the behavioral risk factors essential for NCD prevention and control. Again these findings highlight deficiency of goal-directed teaching in the curriculum.

The respondents perceive to have received adequate knowledge of the requirement of health education and counseling on healthy behaviors. The knowledge regarding recommended age for screening of NCDs and recommended smoking cessation therapy are not known to a large majority of the respondents. The deficiency of applied knowledge and understanding of counseling on healthy behavior is again likely due to the poor teaching-learning process in the curriculum. The graduates appeared to have adequate knowledge regarding the role of NCD prevention, including the contribution of the non-health sector role and the role of potential legal interventions. In terms of attitude & practice questions, the graduates exhibited willingness and agreement to requirements of patient education to prevent and control NCDs.

The qualitative interviews and workshops were high-yielding to bring out reasons for the poor performance of the graduates in the KAP survey, and discussion went beyond NCD to discuss the existing curriculum, responsibilities, and problems of teaching-learning methods in the current perspective of Bangladesh. The workshops were participated by >100 senior medical teachers and other stakeholders of the NCDC program and medical education. The discussions reiterated the responsibility of medical schools to educate physicians who can provide integrated health care services, including curative and preventive components to individuals and the community. They should acquire the necessary knowledge and skills for management of health services with a scientific background and necessary skills to conduct research and be able to make plans to improve the health level of the community.¹⁰ Bangladesh requires more health professionals equipped to tackle its serious health challenges. The existing undergraduate medical curriculum requires transforming its educational offerings to ensure its students practice competently and contributing to improving population health. The newer graduates felt curriculum content overload, inappropriate teaching & assessment methods, the poor performance of the teachers, inadequate program orientation, lack of integration in the curriculum, and work overload during the training period as the reasons for their poor performance. The senior medical teachers felt poor motivation, quality, and accountability of the teachers, erosion of values during assessments, absence

of coordination between the program and the academia, lack of integration and misdistribution of the curricular contents and hours, lack of academic discipline, overload of curricular contents, poor recruitment system of students and poor motivation of students to learn for poor performance.

The traditional structure of medical education has been in place since long, involving two years of basic science training to take place in the classroom, followed by two years of hands-on medical training in a clinical setting. Discussions went along to claim that this teaching system is obsolete and out of touch with the challenges and healthcare needs of our modern society. Medical schools around the world are responding to new innovations in medicine and new healthcare needs of the population by adjusting their student curriculums towards new styles of integrated teaching. One of the main aims of these curriculum redesigns is to teach students to fully understand concepts and develop critical-thinking skills early on in their medical training, rather than have the first two years of medical school be devoted to rote memorization of facts that will likely be forgotten after a final exam.¹¹

The interviews and workshops revealed some reasons for the poor performance of medical graduates overwhelmingly supported by most participants. The most important agreed reasons are- curricular and examination overload, lack of integrated curriculum, mostly large group teaching and many lectures, poor academic discipline, poor motivation of teachers to teach, & lack of co-ordination between the program and the academia. The recommendations of the workshop included that the existing curriculum should be reviewed in terms of identifying the specific competencies for students to be achieved by graduation consistent across schools, engaging stakeholders to understand adequacies and inadequacies of current curricula; and restructure and revise curricula introducing competencies. The discussions proposed that curricular revision of this magnitude requires: a compelling directive for change, designated leadership, resource mobilization, the inclusion of all stakeholders, clear guiding principles, an iterative plan linking flexible timetables to phases for curriculum development, engagement in skills training for the cultivation of future leaders, and extensive communication. It will require medical students to learn more actively, rather than cram

and memorize material, and that it seeks to reflect how medicine has changed over the last 30 years. The old method of cram, regurgitate it on the exam, and forget, is not an appropriate way to prepare graduates for a career that will span 30 to 40 years of clinical practice.¹² Technological advances, in particular the advent of the internet, necessitates a change because factual information is now so much more accessible, it can be taught more efficiently than in a classroom lecture.¹² Medical practice is changing; the health policy environment is changing, so the curriculum should be a dynamic system that would make sure that teaching is done in a way that will really empower students when they're out. The pace of change in medical science and practice can be overwhelming at times, and it is our responsibility to maintain a curriculum that is reflective of this dynamism, responsive to student needs, and centered on patient care skills.¹²

Conclusion:

Readiness to provide program-directed NCD care at the PHC level by the new & older graduates is inadequate. The training programs held earlier on NCD prevention & control could not make the expected outcome. There is clear gap in communication and co-ordination between the program and the academia, leading to unawareness of the program objectives by the medical teachers and inappropriate teaching regarding NCD program objectives. Despite adequate hours of teaching on major NCDs in the existing curriculum, understanding of the goals & objectives of reducing mortality and morbidity from major NCDs remained poor. The allocated hours for teaching and assessment in the subject of Community Medicine are grossly inadequate. Knowledge of Goal-directed management of NCDs and counseling for behavioral risk reduction were not appropriately addressed in the curriculum. The students will continue to perform poorly using the existing curriculum on NCDs.

Limitations of the study: All the well-known flaws in Operations Research has such as a) program initiated and has poorly developed methodologies and objectives, b) time-bound and could not have large coverage, and c) inability to control all factors involved in decision making. But fortunately, the involvement of a multi-disciplinary team rescued many limitations, and the study did not have any major flaws. There was

limitations to call it representative. The study could not assess skill and attitude objectively & tried to assess my skill & attitude-based questions and hence incomplete. During curriculum review, the hours of practical classes (bedside teaching) could not be appropriately calculated because of the non-availability of the records in the medical.

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