

Research Capacity for Prevention and Control of Non-communicable Diseases and their Risk Factors in Nepal: Findings of a Needs Assessment Study

Oli N,¹ Pradhan PMS,² Sagtani RA,³ Shrestha A,⁴ Jaacks LM,⁵ Karmacharya BM,⁶ Danaei G,⁷ Vaidya A¹

¹Department of Community Medicine, Kathmandu Medical College Public Limited, Sinamangal, Kathmandu, Nepal.

²Department of Community Medicine, Institute of Medicine, Maharajganj, Kathmandu, Nepal.

³Department of Community Health, Patan Academy of Health Sciences, Lalitpur, Nepal.

⁴Department of Public Health, Kathmandu University School of Medical Sciences, Dhulikhel, Kavre, Nepal.

⁵Global Academy of Agriculture and Food Security, The University of Edinburgh, Midlothian, UK.

⁶Department of Community Medicine, Dhulikhel Hospital-Kathmandu University Hospital, Dhulikhel, Kavre, Nepal.

⁷Department of Global Health and Population, Harvard T.H. Chan School of Public Health, Boston, MA, USA.

Corresponding Author

Natalia Oli

Department of Community Medicine, Kathmandu Medical College Public Limited, Sinamangal, Kathmandu, Nepal.

E-mail: olinatalia1@gmail.com

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ABSTRACT

Background

Despite a high burden, there are limited trainings in non-communicable disease research in Nepal.

Objective

We conducted a needs assessment to assess existing research training capacity in academic health institutions of Nepal for the prevention and control of non-communicable diseases, identify gaps in research, and explore the feasibility of developing research training program in Nepal targeting non-communicable diseases.

Method

We did mixed-method research and reviewed academic institution curricula and scientific articles authored by Nepali researchers. We conducted 14 Focus Group Discussions with bachelor and masters level students of public health and community medicine; 25 In-depth Interviews with department heads and faculties, and government stakeholders. We surveyed medical and public health students on their research knowledge and skills development.

Result

Research methodology component was addressed differently across academic programs. One-third (33.7%) of students expressed lack of skills for analysis and interpretation of data. They felt that there is a wide scope and career-interest in non-communicable diseases research in Nepal. However, specific objectives in the curriculum and practical aspects regarding non-communicable diseases were lacking. Most of the non-communicable diseases research in Nepal are prevalence studies. Lack of funding, conflicting priorities with curative services, and inadequate training for advanced research tools were reported as major barriers.

Conclusion

Nepal must strengthen the whole spectrum of research capacity: epidemiological skills, research management, and fund development. Generation of a critical mass of non-communicable disease researchers must go together with improved funding from the government, non-governmental, and external funding organizations.

KEY WORDS

Curriculum, Need assessment, Public health, Research methodology

INTRODUCTION

In Nepal, 60% of disability-adjusted life-years is attributed to non-communicable diseases (NCDs), and high prevalence of behavioral and environmental risk factors are the major contributors.¹⁻⁴ An essential strategy to tackle the rising burden of NCDs is development of local research capacity to explore and address NCDs and their risk factors.^{5,6} Towards this, Nepal's Multi-sectoral Action Plan for the Prevention and Control of NCDs 2014-2020 intended to address NCDs through various strategies including research and surveillance.⁷ However, implementation of many of the research components of the Plan have been limited by a shortage of trained researchers.⁸

A strong health research capacity is crucial to establish context-specific evidence-based clinical practice guidelines and public health policies.^{9,10} However, many low-and-middle income countries (LMICs), lack health research capacity, which limits their ability to identify and respond to local health needs.^{10,11} Major gaps and deficiencies in research capacity in many LMICs include low priority for research, insufficient prioritization of problems addressed by research, limited trained researchers, inadequate application of research findings in decision-making, and lack of funding.¹²

In this background, we conducted this needs assessment with the objectives to: (1) assess existing research and research training capacity in academic health institutions of Nepal for NCDs, (2) identify gaps in research training, faculty development, scientific environment, and administrative resources in these institutions, (3) explore feasibility of developing a new or continued research training program in Nepal targeting NCDs and their risk factors.

METHODS

The needs assessment was conducted between June and September 2020 in Nepal using a mixed method approach. We did qualitative and quantitative research, included academic institution curricula review and scientific literature review (figure 1). Findings of the qualitative, quantitative studies, and document review were triangulated to obtain comprehensive in-depth results.

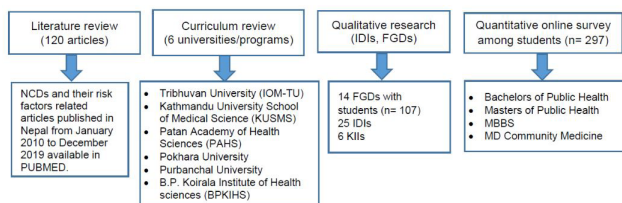


Figure 1. Summary of needs assessment methodology.

FGD: Focus Group Discussions, IDI: Indepth interviews; KII: Key Informant Interviews; MBBS, Bachelor of Medicine and Bachelor of Surgery; NCDs, non-communicable diseases.

Desk review of curricula and scientific literature

We mapped academic health entities across the country that conduct the following academic programs: MD Community Medicine, Masters in Public Health (MPH), Bachelor in Medicine and Bachelor in Surgery (MBBS) and Bachelor in Public Health (BPH). A total of six academic entities consisting of 14 affiliated academic institutes were listed. The majority (12 out of 14) of the academic institutions were located in three of Nepal's seven provinces (Province 1, Bagmati Province, and Gandaki province) (figure 2). Each academic entities have its own curriculum for the academic programs mentioned above. We reviewed curricula for the following programs available in those academic entities : MBBS (six academic health entities), BPH (three academic health entities), MD community medicine (two academic health entities), and MPH (six academic health entities). We explored integration of NCDs and research in the curricula and curricula implementation in the different academic health entities of Nepal.

Another component of our desk review was identifying recent scientific articles authored by Nepali researchers in the field of NCDs published between January 2010 and December 2019 and available in PUBMED. We used the following keywords: "risk factor", "cardiovascular disease", "cancer", "diabetes", "COPD", "Nepal". Altogether 120 articles were retrieved after title and abstract review. Articles published by authors affiliated with local institutions and organizations as well as those published by Nepali researchers who work or study outside the country but conduct their research in Nepal as a first author were included in the review. Data abstraction form was created and contained following sections: researchers' affiliation to academic or non-academic organization of Nepal, type of study, availability of the local or international funding, area of research, and outcomes measured.

Qualitative study

We conducted 14 Focus Group Discussions (FGDs), 25 In-depth Interviews (IDIs), and six Key Informant Interviews (KIIs) across the three provinces. We applied convenience sampling and enrolled altogether 107 students of BPH, MPH, and MD community medicine programs across 11 academic institutes for the FGDs (figure 2).

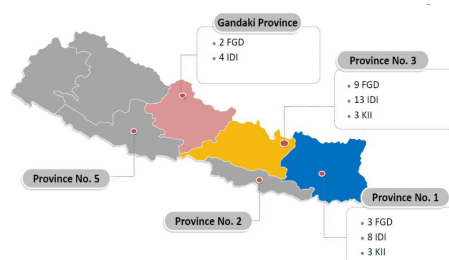


Figure 2. Province map of Nepal depicted sampling for qualitative data collection.

(Source of the map: https://favpng.com/png_view/fundamental-rights-nepal-nepal-vector-graphics-royalty-free-map-illustration-png/3UJQEh9T. Map was modified by authors using Microsoft PowerPoint 2016)

The FGDs aimed to explore students' perceptions regarding coverage of research methodology in their curriculum, particularly research in NCDs and their risk factors, their opinion on curricula implementation in their academic institutions, and barriers and facilitating factors for pursuing a research career in NCDs. Each FGD had 8-10 participants and lasted approximately 90 minutes.

We also conducted 25 IDIs and six KIIs with various stakeholders, including the heads of departments of public health and community medicine, faculties involved in teaching NCDs modules, representatives from the Institutional Review Committee, and experts from environment and nutrition fields. We also interviewed government stakeholders from the Epidemiology and Disease Control Division (EDCD), National Health Training Center (NHTC), and Nepal Health Research Council (NHRC), an ethical and research governing body under Ministry of Health and Population. Respondents for IDIs were selected on the basis of their expertise and their availability at the time of the interview. Interviews queried the stakeholders' perceptions regarding the prioritization of NCD research; training and funding opportunities; how curricula address NCD research; motivating factors for involvement of faculty and students in NCD research; and the proportion of NCD-related proposals submitted to Institutional Review Committees. KIIs and IDIs were carried out at the respondents' working place in a separate room and lasted approximately 60 minutes.

All FGDs and interviews were recorded using a tape recorder after obtaining consent. The recordings were transcribed and then translated from Nepali into English for coding and analysis. Data were analyzed using thematic analysis. We generated a codebook from the transcribed data. Codes were then analyzed for recurring themes.

Quantitative survey

We conducted an online quantitative survey among the final year students of MPH, MD Community Medicine and BPH, and fourth-year MBBS students to evaluate impact of their academic curricula on their research knowledge and skills development. We emailed a semi-structured questionnaire to the students in all the 11 academic institutions where qualitative data collection had been done and we received 297 responses. The specific aims of the survey were to explore knowledge regarding risk factors for NCDs among students, to report their perceived research skills, to identify barriers to conducting research and also to identify the proportion of students with an interest in pursuing a research career in NCDs and their risk factors.

Ethical considerations

The study was reviewed and approved by NHRC prior to the data collection. Approval letters were taken from all the academic institutions that were selected for data collection. All participants provided informed verbal consent. For the qualitative study, the consent included permission for the

audio recording. Confidentiality of the participants was maintained at each step of the study.

RESULTS

We analyzed findings of the qualitative (n=14 FGDs, n=25 IDIs, and n=6 KIIs) and quantitative studies (n= 297) and desk review. We triangulated the results on existing gaps in the research training focusing on NCDs, capacity building, scientific environment, and administrative resources in academic health institutions.

Discrepancies in research methodology coverage and implementation

The curricula review revealed that the research methodology component was addressed differently across academic programs. It exists as a separate subject with a mandatory thesis in BPH, MPH, and MD community medicine curricula. The MBBS curriculum does not emphasize research methodology; research methods are taught as a topic within the community medicine/health subject in their curriculum. BPH and MPH students have regular theory classes with a compulsory thesis/research project at the end of program.

MD Community Medicine students shared that research methodology is taught through active self-learning with thesis as a research outcome at the end of the course and there are no formal classes: *"There is no concrete syllabus focusing on formal class for research. We learn while conducting our thesis through preceptors assigned to us."* MD community medicine students mentioned that they attended research methodology trainings conducted by NHRC: *"We attended trainings, workshops of NHRC which help us in basic proposal development and data management."* Moreover, MD students believed that formal regular classes for research are more effective than short orientations on proposal writing, which are given in mass by some universities in Nepal. Moreover, a majority of students stated that a research methodology module initiated early in the program and targeting thesis writing would be more productive than towards the end of the program.

The students expressed that more time should be allocated for research, especially for developing and practice of research skills. A BPH student commented: *"The time allocated for research is inadequate, so we study in a very superficial manner. While some students might need less time to understand, others will need more time to properly understand research."* The time gap between theory classes and their practical implementation in the academic program was also mentioned as a problem by some students: *"Our curriculum is theory-based in 1st year and when we come to 2nd year it is totally practical based. So, if we had some practical in 1st year, it would be easier for us in 2nd year"* (BPH student).

Perceived low confidence in research capability

Students felt that their knowledge on research is superficial, and therefore, they have low confidence: “We tend to learn research just for the sake of making a proposal to submit to the college to get marks. So, we only tend to get what research is only after we finish our own thesis” (MPH student).

Some students expressed that there is not enough practical exposure to research in their academic program: “It seems like we did thesis only for the sake of doing it...I still don’t clearly know how to write a rational or formulate a research question” (BPH student). Data analysis in particular was a skill that most students felt lacking: “We are weak in the computer application and analysis part” (MPH student).

This was confirmed in the quantitative survey in which one-third (33.7%) of students felt they lacked skills for analysis and interpretation of data (figure 3). However, findings of the survey showed that a majority of MBBS students felt that they had skills for literature search (92.2%) and interpretation of scientific literature (85.9%).

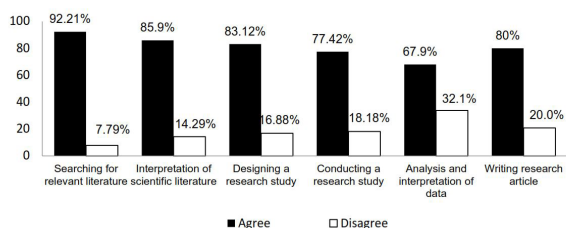


Figure 3. MBBS students’ perceived research skills in general (n = 297).

NCDs and their risk factors are not given enough emphasis in the curricula

The curriculum review revealed some variations between universities and academic programs with regard to emphasis given to NCDs. Universities with a more recent MPH program have newer curricula in which NCDs are taught as a separate module whereas the universities that have been offering academic programs for a longer period of time have not updated their curricula for many years and NCDs are not emphasized. Thus, during FGDs, some students expressed their dissatisfaction regarding coverage of NCDs in their curriculum. They believe that due to the changing pattern of diseases in Nepal, NCDs should be given equal priority to other health problems such as maternal and child health and communicable diseases.

BPH and MPH curricula focus on NCDs and their risk factors epidemiology, preventive measures, international and national programs, and policies to address NCDs. However, the curricula do not cover research methodology for NCDs in detail. BPH programs cover the epidemiology, t

he risk factors, national plans, and policy on NCDs. MD students mentioned that specific objectives in the curriculum regarding NCDs were lacking: “They have just written the topic of NCDs. We don’t know what we

should study in it. We just have a topic and that’s it” (MD Community Medicine student).

Scope for NCDs research in Nepal is rising

The students believed that research creates evidence for policy makers to develop policy and programs for the prevention and control of NCDs. Students shared that there is a broad range of unexplored topics within NCDs in Nepal to be approached through research: “NCDs are diseases that can be prevented if the risk factors are controlled, therefore there is a scope to move ahead” (MPH student). Students felt that there is a wide range of unexplored areas within NCDs in Nepal which is a good opportunity to conduct research: “It is a new topic, since there hasn’t been much research in Nepal, so it is an opportunity for new research plus do the publication... such research will also be an opportunity for us to receive data” (MD student).

Findings from the quantitative survey complemented the qualitative data. More than half of the survey respondents (59%) showed high interest in pursuing research projects after completing their course. Out of these, most of respondents (90%) showed interest in pursuing an NCD-specific research project. A majority of respondents (85%) reported that they have an interest in pursuing a career that involves conducting NCD-related research (figure 4).

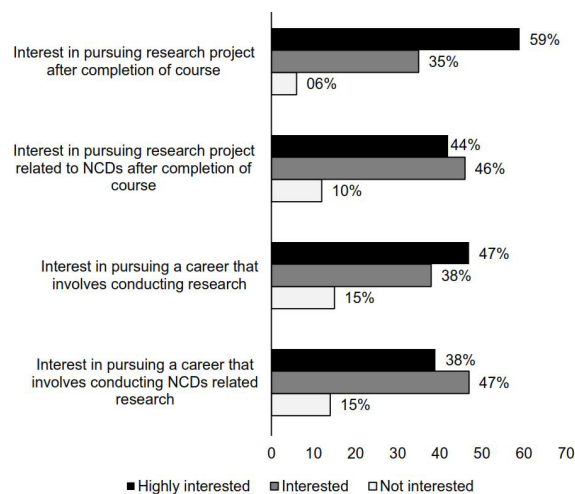


Figure 4. Proportion of MBBS respondents with interests in career in NCDs (n = 297)

Moreover, academic representatives from many institutes (IDIs and KIIs) opined that the interest of research has shifted from communicable diseases to NCDs. According to the Institutional Review Board members, the proportion of NCD-related proposals submitted is about 20% of total proposals and its proportion is increasing over the time.

Most of the NCD studies are cross-sectional in design

The studies on NCDs are mostly done by departments of Medicine, Community Medicine, and Public Health with a majority of them being prevalence studies: “Prevalence study is most common while proposals related to risk factors

are not submitted much because people find it difficult to answer risk factor questions" (Institutional Review Board representative). This statement was also verified by our literature search in PubMed. Observational study design was most common (94%), with cross-sectional studies in particular highly prevalent (77%). Furthermore, there were 15 articles on the subject of cancer, 24 articles on the subject of diabetes, 37 articles on the subject of COPD, and 44 articles on the subject of cardiovascular diseases and hypertension. More than half (54%) of the articles were published in international journals and the rest in national journals. A majority of the articles (117 of 120 articles) claimed absence of any financial support for research.

Enabling factors and barriers for NCD research

Among the enabling factors for conducting NCD research, students mentioned the availability of trained human resource and interest of international donor organizations to fund NCD research. In particular, students pointed out the availability of national governmental funding agencies who have begun to prioritize NCDs for research funding: "NHRC provides research grants for students and NCD is a prioritized topic" (BPH student).

On the other hand, government officials stated that research is given less priority by the government, which affects budget allocated for research activities: "The health workers at public sector should be directly involved in implementation research activities and incorporate research components along with services. For that, it is very important to add up in their capacity building. Yet the Government of Nepal has not been giving much attention in capacity building of health workers for research" (Ministry of Health and Population official).

Respondents of the KIIs pointed towards the importance of collaboration between government and academic institutes for research, which can motivate faculty to conduct research: "If government trust academia instead of inviting independent consultants and involves academia in the research projects we can also mobilize our students there" (Academic faculty). Furthermore, students shared that increasing awareness among people about research contributes toward their better cooperation during data collection: "People use to think that their data will be sold off for money - such perception is not there nowadays. They have understood to a certain extent that their information will be used to make plans and policy" (BPH student). Additionally, most of the respondents of the qualitative study shared the opinion that the availability of specialized hospitals like cancer hospitals, which generate a large amount of data on NCDs and easy access to these data are important enabling factors for research in NCDs.

Regarding barriers for conducting NCD research, the students emphasized that curative aspects of NCDs are given more priority in Nepal than research on prevention and health promotion: "I see lots of opportunities in NCDs

when I look at the data now. But, since our government is fully focused on the curative aspect, it is a great challenge for us to move forward in this aspect" (MPH student).

Inadequate training for advanced research tools were also reported as a major barrier in conducting NCD research: "While we might be able to conduct cross-sectional or case-control study design, we still can't conduct cohort or randomized control trials, since we don't know the methodology for such research" (MD Community Medicine student).

Similarly, respondents of the KIIs believed that research capacity building in relation to NCDs in public health is important for Nepal. They shared that emphasis also should be given on multi-sectoral and inter-institutional collaboration to develop research capacity as well as for conducting advanced research: "We should make a pool of researchers including experts of various fields of research like an expert in the meta-analysis, an expert in systemic review, an expert in NCDs" (Academic faculty).

IDIs also highlighted underestimation of research values in Nepal as an important barrier for research: "There is absence of research culture in the academic sector especially among the senior faculty. People have the concept that "I am already a professor now why should I do research?" (Academic faculty), and, "Faculty have been showing keen interest in research nowadays, however, the question is whether they are doing research to fulfill the academic criteria for promotion or they are really doing for the matter of passion, that is something that needs to be explored further" (Academic faculty).

The KIIs also pointed at administrative barriers for conducting research in Nepal: "Lack of strong administration, as well as improper coordination with the administration, has been hampering the research activities in institution" (Academic faculty). Students shared that unavailability of primary data or proper registries makes it harder to conduct NCDs research: "We have been reporting communicable diseases to Health Management Information System (HMIS) but I don't think there is a reporting form in HMIS for NCDs. So, I think that acts as a barrier. No primary data is available. We have to start from the very basic level" (MD Community Medicine student).

Lack of funding is another barrier that was reported as the reason for the limited number of interventional studies in the country: "I am a student and I want to do research in NCDs, and I have research that involves clinical testing. But how can I do it when I don't have a resource to obtain those tests?" (BPH student). These findings were supported by the quantitative survey (table 1).

DISCUSSION

Strong research capacity and environment are critical prerequisites for NCDs prevention and control. For this

Table 1. Perceived Barriers in conduction of Research by MBBS students (n = 297)

Barriers	Percentage (%)
Lack of funds	92.6
Lack of awareness	91.2
Lack of training opportunities	91.3
Lack of self interest	83.8
Supervising faculty	82.7
Lack of encouragement/academic environment	79.0
Lack of time	72.5

reason, the World Health Organization Global NCD Action Plan 2013–2020 aims to promote and support national capacity for high-quality research and development for the prevention and control of NCDs.¹³ However, the latest global assessment of national capacity for the prevention and control of NCDs (2019) revealed that only 33% of countries had an operational NCDs-related research policy or plan that included community-based research and an evaluation of the impact of interventions and policies.¹⁴ But these documents do not overtly discuss the need of skilled human resources in research, something which is reflected also in the national NCD action plan of Nepal.⁸ Capable human resource is a clear prerequisite for meaningful implementation of WHO's Guide to implement research in the prevention and control of NCDs.¹⁵ Particularly in the context of LMICs like Nepal, research capacity strengthening needs to be done proactively and in a planned manner.^{16,17}

Our study has revealed the potential for increasing NCD research capacity in Nepal. There is insufficient emphasis on NCD research in graduate and post-graduate level of medical and public health teaching. In the past 10 years, most NCD-related research was either national level surveys or small cross-sectional studies. Methodologically advanced studies including longitudinal research with or without interventions are rare. Hence, improvement in NCD research capacity including research skills, research management, and fund generation is the current need. Studies from other countries have revealed similar findings.¹⁸

Research capacity should be enhanced from the undergraduate level

There is a dire shortage of investigators who are well trained to conduct research in NCDs in Nepal. This stems from the fact that research is not adequately and uniformly reflected in the undergraduate and postgraduate health-related disciplines. Due to the self-learning nature of post-graduate residency programs, the residents find it difficult to grasp the basic concepts of research methods before conducting their thesis. Although some universities and institutes organize a short-term orientation or training on research methods for postgraduates, these are often not adequate. The concept of research was not included

mostly as a theory paper in a majority of MBBS curricula of Nepal. To address this gap, some institutions have introduced research methods in the MBBS curricula providing the students opportunity to conduct small-scale doable research.^{19,20}

Post-Masters capacity building efforts must be strengthened

Research culture in general is still very naive in Nepal. The higher education system of the country is yet to adapt to the international research concepts such as post-doctoral positions. In any case, there are limited opportunities to do doctoral studies in Nepal, and more so, in NCDs. One of the reasons for this is the limited number of faculty specialized in NCDs. However, some of the global programs such as The Bernard Lown Scholars in Cardiovascular Health Program at the Harvard T.H. Chan School of Public Health, have provided opportunities for Nepalese researchers to sharpen their capacity in cardiovascular health research.²¹ Furthermore, emphasis must also be given to foster research culture and capacity at the institutional level, and not only at the individual level, so that administrative barriers are minimized, and research endeavors are enabled rather than hindered.²²

Furthermore, due to the transdisciplinary nature of NCDs, we need to train researchers in different disciplines or bring together leaders from different disciplines to work together. We need to foster partnerships with NCD leaders with support from major global funding agencies. An example of one such initiative in Nepal is the Translational Research Capacity Building in Cardiovascular Diseases funded by The National Heart, Lung, and Blood Institute (NHLBI).^{23,24} There are examples of collaboration of institutions from LMICs partnering with research institutions from high-income countries.²⁵ More of such initiatives will help link the subject experts, who are typically widely cited scholars with multiple funded projects, and local experts who are more familiar with contextual matters and ground realities.

NCD research funding must be increased

Lack of funding for health research has been a major barrier to researchers from Nepal to conduct studies on NCDs. There is global disproportionate allocation of research funding which favors communicable diseases more compared to NCDs.^{26,27} NCDs account for 60% of global disability adjusted life years and 70% of global deaths but receive less than two percent of health research funding.²⁶ Communicable diseases have clearer cause-effect relationship which make interventions generate desirable outcomes on time. NCDs, on the other hand, run a more chronic course than infectious diseases with multifactorial nature of causation. The most effective interventions for NCDs are population-based with multi-sectoral approach which includes medical, academic, and administrative domains.²⁶ This demands greater resources to conduct high-quality research and generate robust evidence that can inform policy.

The major source of funding for Nepalese health researchers comes from the health research funding allocated from total health budget, which is channeled through different universities and councils. NHRC and University Grants Commission provide research funding in the form of grants which are given across levels, from undergraduate to post-graduate and faculty. Provision of grants at the undergraduate level is an appreciable step to instill research interest in students which will help build a strong research portfolio that is needed to pursue a future career in research. However, the amount of funding allocated for health research is less in proportion to the total health budget. This translates to a very meagre amount at the level of the researcher, which can be utilized to conduct only small sample surveys. Large-scale studies with longitudinal design and randomized controlled trials, which are typical of NCD research, are only possible with significant funding from high-income countries, and not all Nepalese researchers have the capacity to apply for such grants.²⁸ Even though NHRC has been advocating for increment in health research budget to at least 2% of the total national health budget, there needs to be significant increment to cadre the capacity building of Nepalese researchers in NCDs.²⁹

Strengths and limitations of the study

This study explored the research capacity among the public health, medical and community medicine graduates, particularly in NCDs, for the first time in Nepal, and one among the few studies done globally. We looked at the perspectives of both the students and the teachers, as well as the government stakeholders. Triangulating the findings from qualitative, quantitative, and desk reviews is another strength of the study. Further, our research has reached out to most of the geographic locations of Nepal where medical and public health institutes are located. Also, in terms of respondents, it has a good mix of respondents from governmental and private sector institutes.

The study has some limitations, too. Awareness about the background of the researchers could have led to some amount of information/researcher bias, and hence our qualitative and quantitative data results could be partially affected by this. Due to the current pandemic, we could not do face-to face quantitative data collection, and therefore, we reached out to the students online through the institutional faculties. Though we did not calculate a sample size, we received responses from a lesser number of respondents than expected, and our sample is likely to suffer from sampling bias as well. Additionally, we use only PUBMED data base for articles search that, therefore we could miss some publications.

CONCLUSION

In order to enhance its efforts towards prevention and control of the rising burden of NCDs, Nepal must generate local evidence based on epidemiological studies that measure disease burden, evaluate programs, explore feasibility of interventions, and analyze policies. For this, Nepal needs to strengthen the whole spectrum of research capacity: epidemiological skills, research management, and fund generation. This should begin at the level of undergraduate and post-graduate public health training. University curricula should match up with the NCD burden of the country and must emphasize on applied practical research projects. Generation of a critical mass of NCD researchers must be together with improved NCD funding from the government, non-governmental, and external funding organizations.

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REFERENCES

1. World Health Organization. Disease and country estimates. Geneva: World Health Organization, 2013.
2. Murray CJ, Aravkin AY, Zheng P, et al. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet* 2020;396(10258):1223-49.
3. Dhimal M BB, Bhattarai S, Dixit LP, Hyder MKA, Agrawal N, Rani M, Jha AK. Report of Non Communicable Disease Risk Factors: STEPS Survey Nepal 2019. Kathmandu: Nepal Health Research Council, 2020.
4. Karki KB, Dhakal P, Shrestha SL, et al. Situation analysis of ambient air pollution and respiratory health effects in Kathmandu valley: Nepal Health Research Council, 2016.
5. Sturke R, Vorkoper S, Duncan K, et al. Addressing NCDs through research and capacity building in LMICs: lessons learned from tobacco control. *Global health action*. 2016;9:32407-07. doi: 10.3402/gha.v9.32407
6. Allen L, Cobiac L, Townsend N. Quantifying the global distribution of premature mortality from non-communicable diseases. *Journal of Public Health*. 2017;39(4):698-703. doi: 10.1093/pubmed/idx008
7. Government of Nepal. Multisectoral Action Plan for the Prevention and Control of Non-communicable diseases (2014–2020). Government of Nepal and World Health Organization, Kathmandu, Nepal; 2010.
8. Vaidya A. Capacity building: A missing piece in Nepal's plan for prevention and control of non-communicable diseases. *Journal of Kathmandu Medical College* 2018;7(4):131-33.
9. United Nations Development Programme. Technical advisory paper. Oxford University Press, Inc: 1999.
10. McKee M, Stuckler D, Basu S. Where There Is No Health Research: What Can Be Done to Fill the Global Gaps in Health Research? *PLOS Medicine*. 2012;9(4):e1001209. doi: 10.1371/journal.pmed.1001209

11. The Lancet Global Health. Lessons in humility. *Lancet Glob Health*. 2021 Jul;9(7):e880. doi: 10.1016/S2214-109X(21)00268-0. PMID: 34143981.
12. Davey S. The 10/90 report on health research 2003-2004. Global Forum for Health Research; 2004.
13. World Health Organization. Global action plan for the prevention and control of noncommunicable diseases 2013-2020: WHO; 2013.
14. World Health Organization. Assessing national capacity for the prevention and control of noncommunicable diseases: report of the 2019 global survey. WHO; 2019.
15. World Health Organization. A guide to implementation research in the prevention and control of noncommunicable diseases. WHO; 2016.
16. Sturke R, Vorkoper S, Duncan K, et al. Addressing NCDs through research and capacity building in LMICs: lessons learned from tobacco control. *Global health action*. 2016;9(1):32407.
17. Malekzadeh A, Michels K, Wolfman C, et al. Strengthening research capacity in LMICs to address the global NCD burden. *Global Health Action*. 2020;13(1):1846904.
18. Kilic B, Phillimore P, Islek D, et al. Research capacity and training needs for non-communicable diseases in the public health arena in Turkey. *BMC Health Serv Res*. 2014;14:373. doi: 10.1186/1472-6963-14-373 [published Online First: 2014/09/07]
19. SCIENCES BPKIOH. The MBBS curriculum of B. P. Koirala Institute of Health Sciences, Dharan. 2nd Edition ed, 2014.
20. PAHS School of Medicine . Undergraduate Medical (MBBS) Curriculum Patan Academy of Health Science, Revised 2020.
21. Harvard T.H. Chan School of Public Health . The Bernard Lown Scholars in Cardiovascular Health Program: Harvard T.H. Chan School of Public Health [cited 2018 21 April]. Available from: <https://www.hsph.harvard.edu/lownscholars/>.
22. Haregu TN, Byrnes A, Singh K, et al. A scoping review of non-communicable disease research capacity strengthening initiatives in low and middle-income countries. *Global Health Research and Policy*. 2019;4(1):31. doi: 10.1186/s41256-019-0123-1.
23. National Information Center on Health Services Research and Health Care Technology (NICHSR). Information about ongoing health services research and public health projects 2017. Available from: https://hsrproject.nlm.nih.gov/view_hsrproj_record/20182495.
24. Archana S, Karmacharya B, Maharjan R, et al. Stakeholder Engagement in Planning the Design of a National Needs Assessment for Cardiovascular Disease Prevention and Management in Nepal. *Global Heart*. 2019;14:181-89. doi: 10.1016/j.gheart.2019.05.002
25. Bloomfield GS, Xavier D, Belis D, et al. Training and Capacity Building in LMIC for Research in Heart and Lung Diseases: The NHLBI-UnitedHealth Global Health Centers of Excellence Program. *Glob Heart*. 2016;11(1):17-25. doi: 10.1016/j.gheart.2016.01.004 [published Online First: 2016/04/23]
26. Allen L. Non-communicable disease funding. *Lancet Diabetes Endocrinol*. 2017;5(2):92. doi: 10.1016/s2213-8587(16)30420-x [published Online First: 2016/12/21]
27. Shrestha S. Challenges and opportunities of public Health Research in Nepal. *Kathmandu University Medical Journal*. 2014;12(1):1-3.
28. Sharma JR, Khatri R, Harper I. Understanding health research ethics in Nepal. *Developing world bioethics* 2016;16(3):140-47.
29. Nepal Health Research Council (NHRC). Health Research System In Nepal. NHRC, Ramshah, Government of Nepal; 2006