

Perspective

Risk Factors Associated with Non-Communicable Diseases: Trends and Policy Implications in Nepal

Lonim Dixita,¹ Hyder M Khurshid,² Ehsanullah Tarin³

^{1,2}World Health Organization, Nepal; ³Health System and Policy Consultant

Abstract

Objective: To determine the trends in the prevalence of non-communicable diseases associated risk factors and implications for policies and strategies.

Background: Non-Communicable Diseases (NCDs) contribute increasingly to disease burden in Nepal. The main drivers to this situation are the NCD related risk factors; and to determine their prevalence the Nepal Ministry of Health and Population conducted WHO Stepwise Approach to NCD Risk Factor Surveillance (STEPS) surveys in 2007, 2012 and 2019. This paper, by using results of STEPS surveys, explores the trends of NCD related risk factors and their implications for policies and strategies.

Methods: This paper relies on the desk review of literature and secondary data, collected from the unpublished grey literature, mainly reports of the STEPS surveys. In addition, to corroborate findings, the evidence and experience from other countries available as published literature was brought. The data were analysed manually.

Findings: Overall, during the period from first survey in 2007 to the last survey in 2019, there has been an increasing prevalence of NCDs associated lifestyle and behavioural, physical, and biochemical risk factors. Taking cognisance of these, several policies, and strategic documents, some of which generic, while others targeting the specific risk factors were produced. However, indicators and techniques used, across three STEPS surveys, were not consistent, thus limiting the comparison and analysis of data.

Conclusions: The study concludes that different STEPS surveys did not use standard set of indicators and techniques. Yet, an increased prevalence of NCDs associated risk factors was noted. Several policies and strategic documents, generic as well as specific, were produced. But there is a need to define methodology, as to how results feed into the framing of policies and strategic, and their impact is monitored.

Corresponding Author | Dr Ehsanullah Tarin, Health System and Policy Consultant. Email: hssekta@gmail.com

Keywords | NCDs, STEPS survey, Nepal

Introduction:

The WHO Stepwise approach to NCDs risk factor surveillance or STEPS survey, designed to strengthen surveillance capacity, uses data about risk factors that influence disease (NCDs) burden. The risk factors are the attributes, characteristics, or conditions that increasingly predispose individuals to the likelihood

of developing an NCD. These factors are behavioural, i.e., tobacco use, harmful use of alcohol, unhealthy diet (low fruit and vegetable intake, high salt intake), and insufficient physical activity. The overweight, obesity, and raised blood pressure is assessed by physical measurements. The biochemical risk factors are the other category that include, raised blood glucose, and raised cholesterol. Altogether, these eight behavioural and bio-

chemical risk factors are included in the STEPS NCDs risk factors surveillance.¹

The generic design of WHO STEPS survey, as the name implies, covers three different levels or "STEPS" for risk factor assessment. STEPS 1 constitute a questionnaire for collecting self-reported data on the behavioural attributes like, tobacco and alcohol use, nutritional habits, and physical inactivity (measured on the scale of 150 minutes of moderate-intensity aerobic exercise each week that equal to about 500 MET minutes per week²), as markers of the current and future health status. In STEPS 2, **physical measurements** such as height, weight, waist circumference (for calculating BMI or body mass index), and blood pressure (BP), both systolic (SBP) and diastolic (DBP), are taken. STEPS 3, which adds on to steps 1 and 2, is meant to gather **biochemical information** involving collecting and analysing blood samples for fasting blood glucose and total blood cholesterol.³

Nepal, for measuring NCDs associated risk factors, conducted STEPS survey in 2007, 2013, and 2019. The reports of these STEPS surveys provide the (temporal) trend of the prevalence of NCDs associated risk factors. Also, through these surveys information on health seeking behaviour and the availability of NCD health services was gathered. In addition, evidence is collected about variation in the prevalence of NCDs associated risk factors by provinces, level of household wealth, and urban rural disparities.⁴ This paper, after providing background and a short note on methodology, discusses the changing trend in the prevalence of NCDs associated risk factors between 2007 and 2019. Finally, conclusions are drawn, and recommendations made regarding the future health policy and strategies and the specific interventions.

Background:

Non-Communicable Diseases (NCD) include mainly the ischaemic heart diseases (IHD), cancer, diabetes mellitus, chronic respiratory diseases, and injuries. Contributing increasingly to the disease burden in Nepal, the prevalence of IHD was 2.9%, while diabetes mellitus affected 8.5% of population, and 11.7% people had chronic obstructive pulmonary disease⁵. In terms of morbidity, overall, the NCDs accounted for 66% of the total death count, albeit the probability of

premature deaths, over the years, has been decreasing. IHDs have the largest share (30%), while cancer and injuries contribute 9% each to death burden. Chronic respiratory diseases and diabetes cause 10% and 4% of total death toll respectively.⁶

Globally, risk factors, like tobacco use, physical inactivity, harmful use of alcohol, unhealthy diets and other lifestyle related behaviours, which contribute largely to high blood pressure, obesity, high blood glucose and cholesterol levels have driven to the rise of NCDs,⁷ and so has happened in Nepal. Evidence to that comes from STEPS survey conducted in 2019, which reported increasing prevalence of risk factors related to lifestyle and behavioural elements, physical, and biochemical measurements.⁸ Conscious of these growing challenges, the National Health Policy 2014 updated in 2019, the National Health Sector Strategy 2016-20 and related documents were framed to, inter-alia tackle NCDs. In this regard, WHO Package of Essential Non-Communicable Diseases (PEN) was adapted in 2016 and interventions were implemented in 2017 at primary care level. NCD services are also included in the lately defined Basic Health Services Package. But the trigger to these, and other health related interventions is the mandate given to the state under article 35(3) of the constitution, which states that "every citizen shall have equal access to health services".⁹

The major contributors to the burden of NCDs are the risk factors, which have their roots in the social, economic, and environment. Therefore, the prevention and control of NCDs and its risk factors is beyond the health sector alone, instead fall mainly in the domain of the non-health sectors. Given this, the multisectoral collaboration has a central role in combating NCDs. Nepal, being a signatory to the United Nations High Level Committee meeting in 2011, developed a Multisectoral Action Plan 2014-20 for the Prevention and Control of NCDs.¹⁰ To facilitate the "whole of government" and "whole of society" approach, a High-Level Committee, led by the Chief Secretary to the Government of Nepal, provided policy direction to accelerate the implementation of Multisectoral Action Plan.

Furthermore, a Nepal Public Health Service Act 2018 has been enacted. In addition to providing an opportunity for multisectoral engagement, this law directs the non-health sectors to commit and contribute resources for tackling risk factors associated with NCDs. It envisages

the establishment of a Multisectoral Public Health Board, which, under the leadership of Health, brings together non-health sectors to address the determinants of health within their realm and domain. Also, Nepal, in pursuit of achieving SDG 2030, has set a target of reducing mortality due to NCDs, by one-fourth, by 2025, and, by one third, by 2030.¹¹ It is, in line with that the National Health Policy 2019 and Multisectoral Action Plan 2014-20 emphasizes the prevention and control of NCDs through multisectoral collaboration.

Study Aim:

The aim of the study is to determine the trends in the prevalence of non-communicable diseases associated risk factors and implications for policies and strategies. Nepal, to measure the risk factors associated with NCDs, conducted STEPS survey in 2007, 2013, and 2019. This paper, to provide temporal variation in the

prevalence of NCDs associated risk factors, reviews the results of STEPS surveys.

Methodology:

The STEPS survey of NCDs associated risk factors was carried out in 2007-8, 2012-13 and 2018-19. Each time, this was a nationwide population-based survey of the adults, both males and females, aged 15–69 years. A multistage sample design was used to produce the representative data for the defined age range. Table 1 provides sample size and the overall response rate for the three STEPS surveys undertaken in Nepal.

Table 1: STEPS Survey Year and Sample Size

Year	Sample size	Overall response rate
2007-08	4,328	98.4%
2012-13	4,143	98.6%
2018-19	5,593	86.4%

Table 2: Trend in the Prevalence of NCDs Associated Risk Factors

Risk factor type	Variables	Prevalence (2007-8)	Prevalence (2012-13)	Prevalence (2018-19)
Step 1: behavioural questionnaire	%, who currently use tobacco (smoked/ smokeless)	NA	NA	24.1
	%, who currently smoke tobacco daily	23.8	15.8	13.3
	%, who are smoking manufactured cigarettes (from a mongst the current smokers)	73.9	84.8	14.8
	%, who currently drink (drank alcohol in the past 30 days)	28.5	17.4	20.8
	%, who ate less than 5 servings of fruit and/or vegetables on average per day	61.9	98.9	96.7
	%, with low levels of activity (defined as < 600 METminutes per week)	5.5	3.5	7.4
Step 2: physical measurements	%, who are overweight (BMI ≥ 25 kg/m ²)	7.2	21.6	24.3
	%, who are obese (BMI ≥ 30 kg/m ²)	1.7	4.0	4.3
	%, with raised BP (SBP ≥ 140 and/or DBP ≥ 90 mmHg) who are currently on medication for the raised BP	21.5	25.7	24.5
Step 3: biochemical measurements	%, with raised fasting blood glucose (plasma venous value ≥126 mg/dl) currently on medication for raised blood glucose	NA	3.6	5.8
	%, with raised total cholesterol (≥ 190 mg/dl) currently on medication for raised cholesterol	NA	22.7	11.1
Summary of combined risk factors				
<ul style="list-style-type: none"> ▪ current daily smokers ▪ < 5 servings of fruit and vegetables/ day ▪ low level of activity 		<ul style="list-style-type: none"> ▪ overweight (BMI ≥ 25 kg/m²) ▪ raised BP (SBP ≥ 140 and/or DBP ≥ 90 mmHg) currently on medication for raised BP 		
Variables (summary NCDs risk factors)		Prevalence (2007-8)	Prevalence (2012-13)	Prevalence (2018-19)
%, with none of above risk factors		22.0	0.4	NA
%, with three or more of above risk factors, aged 15-44 years		5.7	9.8	NA
%, with three or more of above risk factors, aged 45-69 years		20.1	29.5	NA
%, with three or more of above risk factors, aged 15-69 years (total age group)		NA	15.1	NA

The secondary data collected from unpublished reports of the STEPS was tabulated for the main factors / variables. Alongside, the policy and strategic interventions made during 2008 to 2020 were identified. In this manner, trends in the prevalence of NCDs risk factors in relation to the policies and strategies implemented between 2007 and 2020 were defined. To corroborate, findings of Nepal STEPS surveys were reviewed in relation to the experience available in the published literature. The study is however limited due to the different surveys did not use a standard set of indicators and methodology, as to how results feed into the framing of policies and strategic, and their impact is monitored.

Findings:

The prevalence data of main NCDs associated risk factors, collected through the three STEPS surveys, is tabulated in table 2. This data, representing both sexes, derived from behavioural questionnaire (step 1), physical (step 2) and biological (step 3) measurements, forms the basis of calculating trends in the prevalence of NCDs risk factors.^{12,13}

Trends in the prevalence of behavioural risk factors (both sexes)

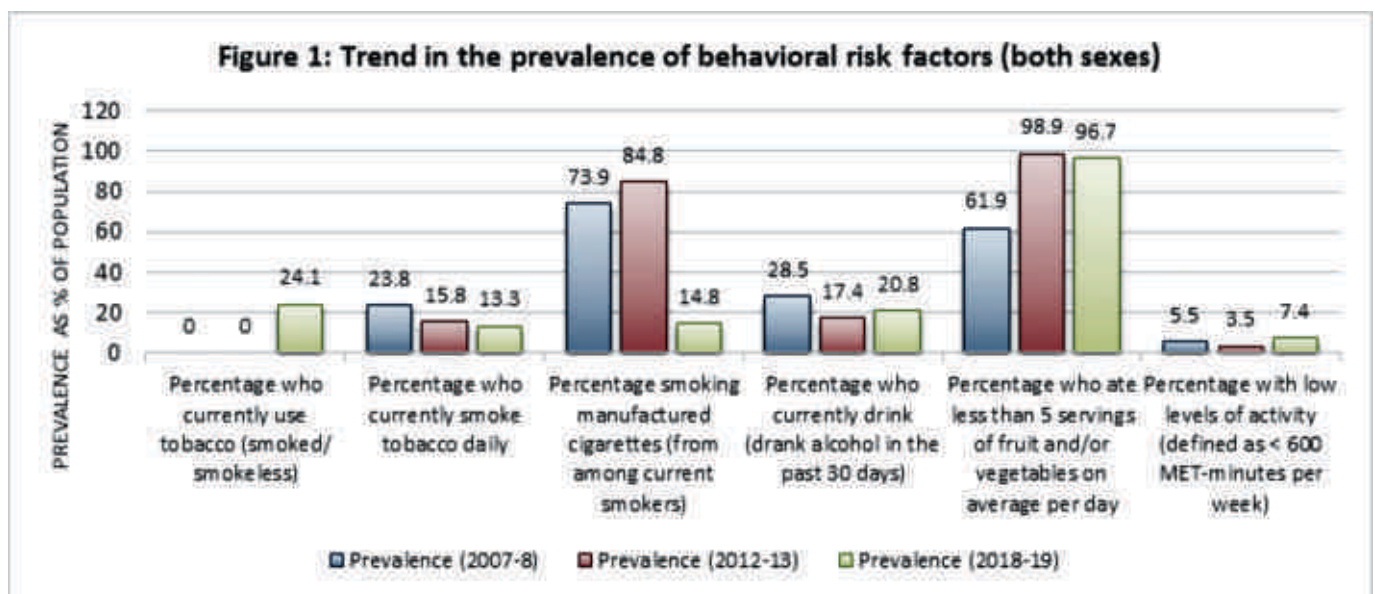
The trend for the six major behavioural risk factors variables, including three concerning tobacco use, one regarding alcohol consumption, and one each for eating habit and level of activity is presented in figure 1. STEPS survey 2019 measured the prevalence of tobacco use. The results are alarming that 24.1% of population was using tobacco, either smoked or smokeless. This indi-

cator, since not measured in earlier surveys, the comparison cannot be made. There is no indicator for measuring use of chewing tobacco, but prevalence of smokeless tobacco use (which include chewable tobacco) in 2019 is deduced, as equivalent to 10.8%. Regarding tobacco smoking, the good sign is that percentage of population who currently smoke daily declined gradually from 23.8% in 2007 to 15.8% in 2012 to 13.3% in 2019. However, the percent of smokers, who smoked manufactured cigarettes, from amongst current smokers, increased from 73.9% in 2007 to 84.8% in 2012, but took a nose down to 14.8% in 2019.

There was a decline in alcohol consumption. The population, who had drunk alcohol in the past 30 days decreased to 20.8% in 2019 from 28.5% in 2007, although a sharp dip 17.4% was observed in 2012. The prevalence of heavy episodic drinking (6 or more drinks on any occasion in past 30 days) was 6.8%. There has not been a healthy trend in the consumption of healthy food. This is evident from STEPS survey results in 2007, when 61.9% of population consumed less than 5 servings of fruits and vegetables, this downward trend increased to 98.9% and 96.7% in 2012 and 2019, respectively. Concomitantly however, the percentage of population with low level of physical activity increased from 5.5% in 2007, after an improvement in 2012, when it stood at 3.5%, to 7.4% in 2019.

Trends in the prevalence of physical risk factors (both sexes)

Regarding physical measurements, three major risk factors, i.e., overweight, obesity and high blood pressure



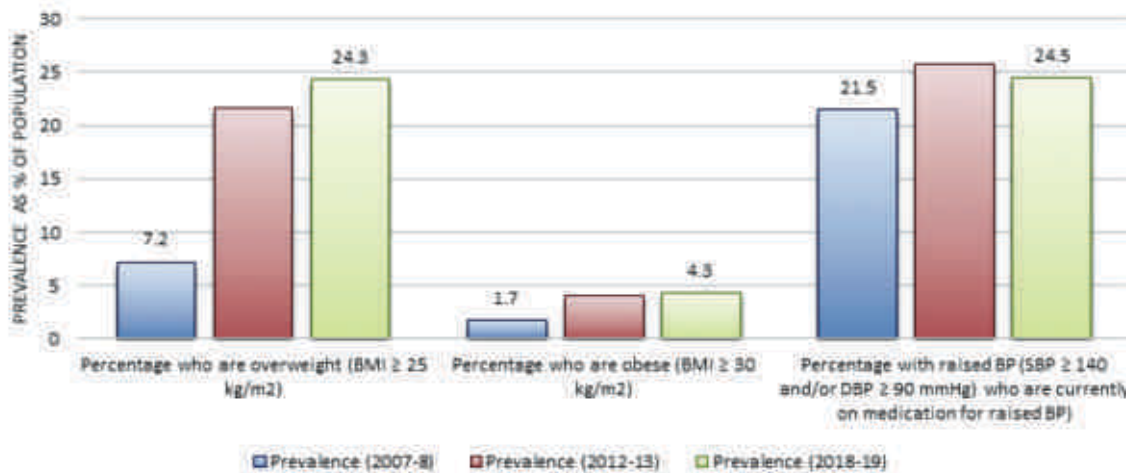
are considered. As seen in figure 2, there is an upward trend in the prevalence that while in 2007 proportion of overweight (BMI ≥ 25 kg/m²) population was mere 7.2%, it increased in 2012 and 2019 to 21.6% and 24.3% of population respectively. Likewise, prevalence of obesity (BMI ≥ 30 kg/m²) increased from 1.7% in 2007 to 4% in 2012 and 4.3% in 2019. Similar trend was noted with respect to the percentage of population with raised blood pressure (systolic blood pressure ≥ 140 and/or diastolic blood pressure ≥ 90 mm hg) and who

are on medication for the raised blood pressure. In 2007, the proportion of population that had raised blood pressure and/or was on medication was 21.5%. This proportion increased to 25.7% in 2012 but slid down slightly to 24.5% in 2019.

Trends in the prevalence of biochemical risk factors (both sexes)

Prevalence of two biochemical risk factors, including raised fasting sugar and raised total cholesterol level

Figure 2: trends in the prevalence of physical risk factors (both sexes)



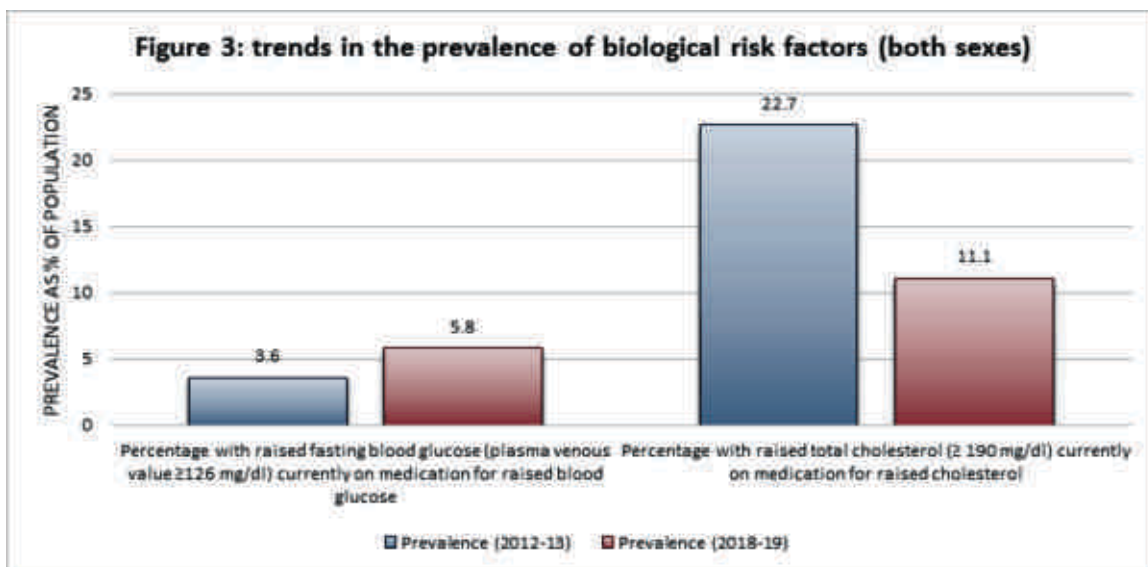
in blood amongst both sexes were determined in STEPS survey 2013 and 2019. Data for biological risk factors was not collected in STEPS survey 2007. The prevalence of raised fasting blood sugar (plasma venous value ≥ 126 mg/dl) amongst population and/or taking medication for raised blood sugar, as seen in figure 3, increased form 3.6% in 2012 to 5.8% in 2019. Contrarily however, the proportion of population with raised total cholesterol

(≥ 190 mg/dl) level in blood in population and/ or taking medication for raised cholesterol decreased almost 100% to 11.1% in 2019 from 22.7% in 2012.

Trends in the prevalence of summary risk factors (both sexes)

Five summary risk factors considered include: (1) current daily smokers; (2) < 5 servings of fruit and vegetables

Figure 3: trends in the prevalence of biological risk factors (both sexes)



per day; (3) low level of activity; (4) raised BP (SBP \geq 140 and/or DBP \geq 90 mmHg) and/ or currently on medication for raised BP; and (5) overweight (BMI \geq 25 kg/m²). Figure 4 provides data on trends in the prevalence of summary risk factors. It is evident that data, over the three STEPS surveys, is inconsistent and

inadequate or incomplete and in certain cases doubtful. According to STEPS survey in 2007, 22% of the population was free of all five risk factors, while this proportion was down to (a doubtful level of?) 0.4% in 2012. Regarding the prevalence of three or more of the risk factors amongst population aged 15 to 69 years was

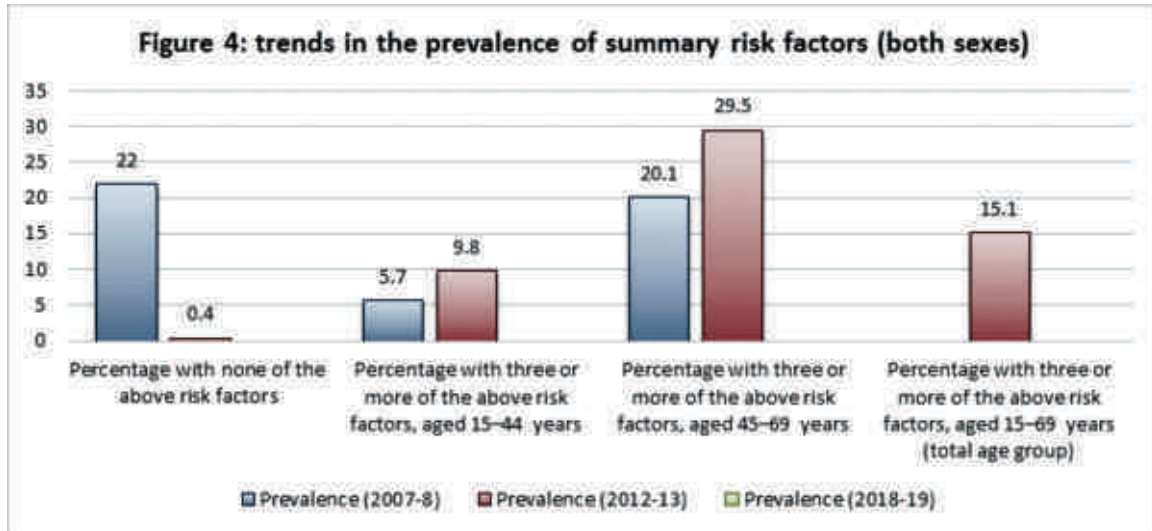


Table 3: Policy and strategy documents/interventions in relation to STEPS survey reports

	2014	2015	2016	2017	2018	2019
STEPS 2012-13	National health policy 2014	National constitution	Nepal targets for SDG 2030	WHO Package of Essential NCDs (PEN)	Public Health Services Act 2018	National health policy 2019
	Multisectoral Action Plan 2014-20	National Health Sector Strategy 2015-20	National Health Sector Strategy Implementation Plan 2016-21		Basic health services package	
STEPS 2018-19	x	x	x	x	x	x

15.1% in 2012, while no data is available from 2007 or 2019 STEPS surveys. About the prevalence of three or more of the abovementioned risk factors amongst population aged 15 to 44 years, which was 5.7% in 2007 increased to 9.8%. Likewise, amongst population aged 45 to 69 years, the prevalence increased from 20.1% in 2007 to 29.5% in 2019.

Trends in prevalence of NCDs risk factors influencing the policies and strategies

STEPS survey reports could be an advocacy tool to influence the policy process and one of the factors guiding the development of initiatives, aimed to address NCDs risk factors. But it is not the only causal factor: there could be many more.

Nonetheless, the archives holding the public sector

documents were sifted/ scrutinised to identify policies and strategies, which were developed followed the publication of the results of the STEPS surveys. These documents with year of publication are tabulated in table 3. No such document was produced after 2007-8 STEPS survey. But at least five documents were produced following the publication of STEPS 2012-13 survey report. The publication of one document (National health policy 2019), coincided with STEPS survey 2019, but was developed earlier and its contents were not influenced by the results of survey.

Discussion:

Nepal undertook WHO STEPS survey, almost after every five years. But the design and attributes, which

were explored related to NCDs risk factors, have evolved over time. STEPS 2007 survey used STEPS 1 and 2 only, i.e., biochemical risk factors (STEPS 3) were not assessed. The latter two surveys (2012-13 and 2018-19), however involved conducting all three STEPS and explored behavioural, physical as well as biochemical risk factors. Furthermore, the indicators measured regarding the behavioural, and physical attributes in STEPS survey 2007 and 2013 were almost similar. But in STEPS survey 2019 more attributes were added, limiting the comparison between the results of three STEPS surveys, and so a robust trend analysis was not possible. That is, for example, while the question about tobacco smoking was asked in all three STEPS surveys, tobacco use including smokeless appeared only in STEPS survey 2019. Thus, while results regarding tobacco smoking were compared and analysed, smokeless use could not.

Table 2 provides data about prevalence of NCDs risk factors retrieved from the three STEPS surveys. It indicates that the design of STEPS survey 2018-19, compared to the earlier two surveys, since covered more variables, was comprehensive, but did not report summary NCDs risk factors. In addition, results indicate some significant shortcomings. There are doubtful results concerning variables, like percentage of population with raised total cholesterol (≥ 190 mg/dl) level in blood amongst population and/or taking medication for raised cholesterol. This decreased almost 100% from 22.7% in 2012 to 11.1% in 2019. In another instance, STEPS survey 2007 and 2012 reported summary results of five risk factors (table 2). It revealed that 22% of population had none of the five risk factors in 2007¹⁴, but in 2012 this proportion was 0.4%¹⁵. Such results cast doubts over the adequacy and consistency of data from the STEPS surveys.

The results of STEPS surveys could be an advocacy tool to influence the process for making policies and strategies and contribute to developing interventions for addressing and impacting the trends in the prevalence of risk factors associated with NCDs. No policy or strategy documents were produced after STEPS survey 2007 but, following STEPS survey 2102 an array of documents was produced. A rapid review of these documents indicates that these are generic, addressing issues not only related to risk factors associated with NCDs but, also other problems facing the health

and health system in Nepal. To what extent have the findings of STEPS 2012-13 survey influenced the conceptualisation and development of the contents of policies and strategies; further research is required. However, there were exceptions like Multisectoral Action Plan 2014-20, adapted in 2016, implementation of WHO Package of Essential NCDs (PEN) in 2017, and the promulgation of Public Health Services Act 2018. These documents are specific, having direct influence on the prevention and control of NCDs.

Conclusions and recommendation

The indicators and techniques used for measuring the lifestyle and behavioural, physical, and biochemical risk factors associated with NCDs were inconsistent across the three STEPS surveys. This resulted in limiting the comparison. Therefore, a robust trend analysis was not possible. Several policies and strategic documents, generic as well as specific, were framed, particularly after STEPS survey in 2012. Yet, there has not been any respite in the increasing trend in the prevalence of key risk factors associated with NCDs. There is therefore a need to learn from the experience for future STEPS survey, particularly in standardising indicators, techniques, and selection of variables. Also, a clear methodology should be defined, as to how the research results feed into the framing of policies and strategic, and modalities of monitoring their impact on the health status of population.

Acknowledgements:

Authors are grateful to the officials in the Ministry of Health and Population especially in the Family Welfare Division, Department of Health Services for providing access to data.

Ethical Approval: Given

Conflict of Interest: The authors declare no conflict of interest.

Funding Source: None

References:

1. Global status report on noncommunicable diseases 2014 [Internet]. World Health Organization. World Health Organization; [cited 2022Nov26]. Available from: <https://www.who.int/publications-detail-redirect/9789241564854>
2. What is metabolic syndrome? [Internet]. www.heart.org. 2022 [cited 2022Nov26]. Available from: <https://>

- www.heart.org/en/health-topics/metabolic-syndrome/about-metabolic-syndrome
3. Non communicable diseases [Internet]. World Health Organization. World Health Organization; [cited 2022 Nov26]. Available from: <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>
 4. Persistent high prevalence of non-communicable diseases risk factors in Nepal [Internet]. World Health Organization. World Health Organization; [cited 2022 Nov 26]. Available from: <https://www.who.int/nepal/news/detail/17-03-2020-persistent-high-prevalence-of-non-communicable-diseases-risk-factors-in-nepal>
 5. Dhimal M, Karki KB, Sharma SK, Aryal KK, Shrestha N, Poudyal A, Mahato NK, Karakheti A, Sijapati MJ, Khanal PR, Mehata S. Prevalence of selected chronic non-communicable diseases in Nepal. *Journal of Nepal Health Research Council*. 2019 Dec 13;17(3):394-401.
 6. Noncommunicable Diseases Country Profiles 2018 [Internet]. World Health Organization. World Health Organization; [cited 2022Nov26]. Available from: <https://www.who.int/publications-detail-redirect/9789241514620>
 7. Noncommunicable Diseases [Internet]. World Health Organization. World Health Organization; [cited 2022 Nov26]. Available from: <https://www.who.int/health-topics/noncommunicable-diseases>
 8. Prevalence of non-communicable diseases risk factors and their determinants: Results from Steps Survey 2019, Nepal [Internet]. *PloS one*. U.S. National Library of Medicine; [cited 2022Nov26]. Available from: <https://pubmed.ncbi.nlm.nih.gov/34329300/>
 9. Ministry of Law, justice and parliamentary affairs (Nepal) [Internet]. Wikipedia. Wikimedia Foundation; 2022 [cited 2022Nov26]. Available from: [https://en.wikipedia.org/wiki/Ministry_of_Law,_Justice_and_Parliamentary_Affairs_\(Nepal\)](https://en.wikipedia.org/wiki/Ministry_of_Law,_Justice_and_Parliamentary_Affairs_(Nepal))
 10. Multisectoral Action Plan for the Prevention and Control of Non-Communicable Diseases (2014-2020). World Health Organization; [cited 2022Nov26]. Available from: <https://extranet.who.int/nutrition/gina/en/node/23737>
 11. Govt of Nepal, National Planning Commission, National Review of Sustainable Development Goals, Kathmandu, June 2020 [Internet]. National Planning Commission. [cited 2022Nov26]. Available from: <https://www.npc.gov.np/>
 12. Nhradmin. Non Communicable Disease Risk Factors: Steps Survey Nepal 2018 (updated on 29 June 2018) [Internet]. Nepal Health Research Council. [cited 2022 Nov26]. Available from: <https://nhrc.gov.np/projects/non-communicable-disease-risk-factors-steps-survey-nepal-2018/>
 13. Persistent high prevalence of non-communicable diseases risk factors in Nepal [Internet]. World Health Organization. World Health Organization; [cited 2022Nov26]. Available from: <https://www.who.int/nepal/news/detail/17-03-2020-persistent-high-prevalence-of-non-communicable-diseases-risk-factors-in-nepal>
 14. WHO STEPS Surveillance: NCDs risk factors survey, Society for Local Integrated Development Nepal and WHO, 2008 [Internet]. Ministry of Health and Population. [cited 2022Nov26]. Available from: <https://mohp.gov.np/en/>
 15. WHO, 2020, Together Let Us Beat NCDs: Persistent high prevalence of NCDs risk factors in Nepal [Internet]. World Health Organization. World Health Organization; [cited 2022Nov26]. Available from: <https://www.who.int/nepal/news/detail/17-03-2020-persistent-high-prevalence-of-non-communicable-diseases-risk-factors-in-nepal>.