

NCDs2

by Mohammad Nayeem Hasan

Submission date: 05-Dec-2023 09:27PM (UTC+0530)

Submission ID: 2248657806

File name: Manuscript_NCD.docx (119.07K)

Word count: 2102

Character count: 15343

Investigating the Impact of Selected Non-Communicable Diseases and Associated Risk Factors: Evidence from STEPS Surveys Conducted in South Asian Nations

Introduction:

Non-communicable diseases (NCDs), such as cardiovascular diseases, cancer, respiratory conditions, and diabetes mellitus, persist over time due to a complex interplay of genetic, physiological, environmental, and behavioral factors [1]. Furthermore, these ailments are progressively emerging as prominent factors contributing to illness and death in low- and middle-income (LMI) nations [2]–[5]. As per the World Health Organization (WHO) assessments, non-communicable diseases (NCDs) account for 71% of total global fatalities. Approximately 85% of premature deaths resulting from NCDs take place in low- and middle-income countries (LMICs), and within this demographic, 61% of the deaths affect individuals below the age of 70 [7]. In 2012, NCDs led to a total of 277,500 fatalities, equating to a mortality rate of 564.1 per 100,000 in males and 531.9 per 100,000 in females [8].

The risk factors associated with these significant NCDs are extensively documented and commonly shared [1]. In low- and middle-income countries, a notable increase in cardiovascular risk factors is attributed to behavioral (smoking, alcohol, unhealthy diet, physical inactivity) and biological factors (elevated BP, blood glucose, cholesterol, overweight). These factors are key contributors to non-communicable diseases (NCDs) [9] [10]. Furthermore, the likelihood of non-communicable diseases (NCDs) advancing is noted to escalate when multiple risk factors coexist in an individual, a phenomenon termed as clustering [11]. The World Health Report 2002 emphasized the importance of concentrating on risks and risk factors for both assessment and interventions. In response, the WHO Cross Cluster Surveillance team devised the STEPwise approach to risk factor surveillance (STEPS) in 2000. This methodology is centered on acquiring fundamental data related to established risk factors that play a pivotal role in determining the major disease burden [12].

In the adult population of South Asia, there is a clustering of risk factors for non-communicable diseases (NCDs), and this clustering becomes more apparent as individuals age. In the South-East Asia Region, cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases, primarily, pose a significant and escalating challenge to health and development [13]. In Bangladesh, Bhutan, Myanmar, Nepal, and Cambodia, hypertension and central obesity prevail as major risk factors. Vietnam and Pakistan face hypertension and total cholesterol as predominant risks, while Timor-Leste sees hypertension and diabetes as prevalent. In the Lao People's Democratic Republic, total cholesterol and overweight/obesity are prominent risk factors. Sri Lanka reports hypertension and diabetes as top risk factors [14]. Bangladesh is undergoing both demographic and epidemiological transitions, resulting in a dual burden of diseases. Non-communicable diseases (NCDs) constitute 67% of the total mortality in the country [15].

The member states of the World Health Organization (WHO) have reached a consensus on 25 indicators categorized into three areas. These areas concentrate on crucial outcomes, risk

factors, and the necessary national system responses for preventing and managing non-communicable diseases (NCDs). This includes one target related to mortality, six targets pertaining to risk factors, and two targets associated with national systems [16]. The World Health Organization's (WHO) STEP-wise Surveillance for NCD Risk Factors (STEPS) is a standardized framework for monitoring NCD risk factors. It comprises three steps: behavioral assessment through questionnaires (STEP 1), identification of anthropometric risk factors through physical measurements (STEP 2), and identification of biochemical risk factors through measurements (STEP 3) [12]. According to the World Health Organization's Global Health Risks report, the primary global risk factor for non-communicable diseases (NCDs) in terms of attributable deaths is elevated blood pressure, responsible for 13% of global fatalities. Tobacco use (9%), elevated blood glucose (6%), physical inactivity (6%), and overweight/obesity (5%) are notable risk factors. In Nepal, NCDs account for 66% of all deaths (2016). A 2019 nationwide survey using the STEPS approach revealed elevated risks, including low fruit/vegetable intake (96.7%), tobacco use (28.9%), overweight/obesity (24.3%), and raised blood pressure (24.5%), suggesting a potential future NCD epidemic [5] [6] [7]. Numerous conducted studies have determined that socio-demographic characteristics play a role in the variation of non-communicable disease (NCD) risk factors [8–12].

Assessing the prevalence of non-communicable diseases (NCDs) and identifying high-risk populations are crucial for developing community-based interventions aimed at reducing risk factors. Currently, there is inadequate information for a comprehensive nationwide comparison of NCD prevalence and associated factors in the South Asian region. Previous community-based studies in this area have been constrained to specific regions, providing a limited and potentially skewed representation of the overall NCD scenario [2]–[5], [9], [11], [14], [15], [17]. This study aims to assess epidemiological patterns and determinants of behavioral and biological risk factors associated with specific non-communicable diseases (NCDs).

Methods

Study design and setting

We utilized data from the latest cross-sectional studies of the STEPS survey, following the standardized approach developed by the World Health Organization (WHO) for monitoring NCD risk factors in the Southeast Asia Region (SEAR). The STEPS survey is a global initiative conducted every three to five years in SEAR countries, employing a consistent protocol. The survey's scope encompasses all men and women aged 18 years or older, identifying Bangladesh as their primary place of residence. It is noteworthy that the study considered individuals living in Bangladesh, irrespective of their citizenship status, and excluded only those temporarily visiting (e.g., tourists), residing in military bases or group quarters (e.g., dormitories), or institutionalized (e.g., hospitals, prisons, nursing homes). Essentially, the study aimed to encompass individuals residing across all geographic areas of the country. Samples were collected using a geographically stratified probability-based method with standardized protocols across countries. STEPS surveys follow ethical and technical review processes, seeking approval from national ethics committees. Participants provide oral and written consent, ensuring the

survey respects rights and safeguards ethical considerations. Informed consent is obtained from each participant before interviews, adhering to WHO guidelines [12].

Data harmonization

7 We sourced the latest STEPS survey data for six Southeast Asia Region (SEAR) countries—Bangladesh, Maldives, Myanmar, Nepal, Sri Lanka, and Timor-Leste—from <https://extranet.who.int/ncdsmicrodata/index.php/catalog/>. Out of 12 potential countries, we focused on these six for our study. These countries were selected based on meeting our inclusion criteria and having current standard STEPS data. Some countries were excluded either because WHO did not conduct a STEPS survey in those areas, or their data was not available in the public domain, lacked sufficient data and relevant variables, and had unreported non-response rates. Additionally, some survey reports were either not publicly accessible or not in English.

When analyzing survey datasets, addressing issues like uneven unit selection probabilities is crucial. Sample weights are essential to mitigate bias resulting from disproportionate sampling and non-response, significantly influencing standard error calculations. Excluding weights may lead to biased estimates. In STATA, a singleton was introduced to handle a single primary sampling unit (PSU) within a stratum. We assessed three methods for singleton PSUs: singleton (certainty), singleton (scaled), and singleton (centered). We chose the singleton (scaled) approach for analysis. Categorical variables were appropriately defined for interpretation. After extracting variables from each country dataset, we consolidated them into a unified dataset [12].

Outcome variables

We examined three categories of outcome variables: hypertension, diabetes, and hypercholesterolemia. Each of these outcome variables is a binary classification, designated as "YES = 1/NO = 0.

Hypertension, a significant health risk, often shows no symptoms and is known as a "silent killer." Diagnosis requires consecutive systolic blood pressure readings exceeding 140mm Hg and diastolic readings above 90mm Hg. Contributing factors include unhealthy diet, lack of physical activity, tobacco/alcohol use, and being overweight [18]. Blood pressure measurements utilized a digital monitor, with participants resting for 15 minutes. Three readings were taken, and the mean of the second and third readings was calculated. Observations outside the valid range were excluded. If the third reading was invalid, the average of the first two was considered [12]. Diabetes, characterized by elevated blood glucose, results from insufficient insulin production (Type 1) or ineffective use (Type 2), causing damage to vital organs. Type 2 diabetes, prevalent in those aged 35+, is linked to obesity, inactivity, and smoking, with fasting blood glucose >7 mmol/L indicating diabetes [19]. Lifestyle changes, including regular physical activity, maintaining a healthy weight, nutritious diet, and avoiding tobacco, can prevent or delay Type 2 diabetes onset. Blood glucose levels were assessed during Step 3 of the survey, with

observations falling outside the range of fasting blood glucose <18 mg/dL or >630 mg/dL excluded [12].

Elevated blood cholesterol, defined as a lipid profile ≥ 190 mg/dL or currently on medication, poses heart disease and stroke risks. Hypercholesterolemia is specifically >190 mg/dL or 5 mmol/L. Approximately one-third of global ischemic heart disease cases are attributed to high cholesterol. Early detection through regular screening is a key public health strategy [20]. Observations outside the cholesterol range of <75 mg/dL or >470 mg/dL were excluded, with none falling within this range [12].

Explanatory variables

Demographic details, health measures (tobacco use, diet, alcohol, physical activity), and economic status via wealth index were collected. Physical assessments included height, weight, hip/waist circumference using validated instruments, with barefoot participants in light clothing. Economic status determined through principal component analysis. Physical activity data transformed into MET-minutes per week. Information on hypertension and diabetes treatment obtained, with prescription verification. Measurements conducted by trained enumerators and medical technologists with post-graduate qualifications. Staff underwent comprehensive training, including interactive sessions and pilot testing [12].

Statistical Analysis

We performed a comprehensive analysis using descriptive statistics (percentages) and logistic regression to assess non-communicable disease (NCD) risk factors among participants from different countries and socio-economic backgrounds. Cross-tabulation and X² tests evaluated relationships, with significance set at $p < 0.05$ and 95% confidence intervals. Adjusted odds ratios (AOR) assessed the degree of association. Multicollinearity tests and multivariable logistic regression were conducted. Informed consent and adherence to ethical guidelines, including the revised declarations of Helsinki, were ensured. Weighted estimates were used for national accuracy, and the STROBE Statement guided study reporting [Supplementary Table S1].

Results

References

- [1] WHO, "Noncommunicable diseases." Accessed: Dec. 02, 2023. [Online]. Available: <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>

- [2] A. Boutayeb, "The double burden of communicable and non-communicable diseases in developing countries," *Trans R Soc Trop Med Hyg*, vol. 100, no. 3, pp. 191–199, Mar. 2006, doi: 10.1016/J.TRSTMH.2005.07.021/2/M_100-3-191-TBL001.GIF.
- [3] A. Alwan *et al.*, "Monitoring and surveillance of chronic non-communicable diseases: progress and capacity in high-burden countries," *Lancet*, vol. 376, no. 9755, pp. 1861–1868, Nov. 2010, doi: 10.1016/S0140-6736(10)61853-3.
- [4] K. P. Msyamboza *et al.*, "The Burden of Selected Chronic Non-Communicable Diseases and Their Risk Factors in Malawi: Nationwide STEPS Survey," *PLoS One*, vol. 6, no. 5, p. e20316, 2011, doi: 10.1371/JOURNAL.PONE.0020316.
- [5] B. Bista *et al.*, "Prevalence of non-communicable diseases risk factors and their determinants: Results from STEPS survey 2019, Nepal," *PLoS One*, vol. 16, no. 7, p. e0253605, Jul. 2021, doi: 10.1371/JOURNAL.PONE.0253605.
- [6] WHO, "Global Health Estimates." Accessed: Nov. 22, 2023. [Online]. Available: <https://www.who.int/data/global-health-estimates>
- [7] WHO, "Chronic Diseases-Core package," 2006.
- [8] WHO, "Global status report on noncommunicable diseases 2014." Accessed: Nov. 22, 2023. [Online]. Available: <https://www.who.int/publications/i/item/9789241564854>
- [9] M. Aboobakur *et al.*, "Surveillance for non-communicable disease risk factors in Maldives: results from the first STEPS survey in Male," *Int J Public Health*, vol. 55, no. 5, pp. 489–496, 2010, doi: 10.1007/S00038-009-0114-Y.
- [10] WHO, "WHO EMRO | Causes | NCDs." Accessed: Dec. 02, 2023. [Online]. Available: <https://www.emro.who.int/noncommunicable-diseases/causes/index.html>
- [11] S. M. Ahmed *et al.*, "Clustering of chronic non-communicable disease risk factors among selected Asian populations: levels and determinants," *Glob Health Action*, vol. 2, no. 1, pp. 68–75, 2009, doi: 10.3402/GHA.V2I0.1986.
- [12] WHO, "Noncommunicable Disease Surveillance, Monitoring and Reporting." Accessed: Dec. 02, 2023. [Online]. Available: <https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/steps>
- [13] WHO, "Noncommunicable diseases - SEARO." Accessed: Dec. 03, 2023. [Online]. Available: <https://www.who.int/southeastasia/health-topics/noncommunicable-diseases>
- [14] T. Biswas *et al.*, "Clustering of metabolic and behavioural risk factors for cardiovascular diseases among the adult population in South and Southeast Asia: findings from WHO STEPS data," *The Lancet Regional Health - Southeast Asia*, vol. 12, p. 100164, May 2023, doi: 10.1016/J.LANSEA.2023.100164.

- [15] B. K. Riaz *et al.*, “Risk factors for non-communicable diseases in Bangladesh: findings of the population-based cross-sectional national survey 2018,” *BMJ Open*, vol. 10, no. 11, p. 41334, Nov. 2020, doi: 10.1136/BMJOPEN-2020-041334.
- [16] “About the 66th World Health Assembly.” Accessed: Dec. 02, 2023. [Online]. Available: https://www3.paho.org/hq/index.php?option=com_content&view=article&id=8659:2013-66th-world-health-assembly&Itemid=0&lang=fr#gsc.tab=0
- [17] M. M. Zaman *et al.*, “Clustering of non-communicable diseases risk factors in Bangladeshi adults: An analysis of STEPS survey 2013,” *BMC Public Health*, vol. 15, no. 1, pp. 1–9, Jul. 2015, doi: 10.1186/S12889-015-1938-4/FIGURES/3.
- [18] WHO, “Hypertension.” Accessed: Dec. 04, 2023. [Online]. Available: <https://www.who.int/news-room/fact-sheets/detail/hypertension>
- [19] WHO, “Diabetes.” Accessed: Dec. 04, 2023. [Online]. Available: <https://www.who.int/news-room/fact-sheets/detail/diabetes>
- [20] WHO, “Raised cholesterol.” Accessed: Dec. 04, 2023. [Online]. Available: <https://www.who.int/data/gho/indicator-metadata-registry/imr-details/3236>

Links:

<file:///C:/Users/ASUS/Downloads/aim-25-634.pdf>

<https://downloads.hindawi.com/archive/2018/4965193.pdf>

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0253605>

<https://sci-hub.se/10.1007/s00038-009-0114-y>

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0020316>

<https://dmsjournal.biomedcentral.com/articles/10.1186/s13098-017-0207-3>

<https://bmcpublikealth.biomedcentral.com/articles/10.1186/s12889-015-1938-4>

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0134834>

<https://www.nature.com/articles/1001942>

https://journals.lww.com/ijph/fulltext/2016/60010/prevalence_of_risk_factors_for_non_communicable.4.aspx

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0194819>

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0188619>

<https://link.springer.com/article/10.1186/s12889-016-3489-8>

Country

Follow: [https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370\(23\)00232-8/fulltext](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(23)00232-8/fulltext)

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7703434/>

https://journals.lww.com/ijph/fulltext/2016/60010/prevalence_of_risk_factors_for_non_communicable.4.aspx

<https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-015-1938-4>

<https://sci-hub.se/10.1007/s00038-009-0114-y>

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0253605#pone.0253605.ref004>

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0134834>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7187517/>

<https://iris.who.int/bitstream/handle/10665/205554/B5224.pdf?sequence=1&isAllowed=y>

https://iris.who.int/bitstream/handle/10665/204496/Timor-Leste_2014_STEPS_FactSheet.pdf

23%

SIMILARITY INDEX

18%

INTERNET SOURCES

18%

PUBLICATIONS

5%

STUDENT PAPERS

PRIMARY SOURCES

1

link.springer.com

Internet Source

3%

2

Sitasnu Dahal, Ram Bilakshan Sah, Surya Raj Niraula, Rajendra Karkee, Avaniendra Chakravartty. "Prevalence and determinants of non-communicable disease risk factors among adult population of Kathmandu", PLOS ONE, 2021

Publication

1%

3

journals.plos.org

Internet Source

1%

4

library.health.go.ug

Internet Source

1%

5

Tuhin Biswas, Nick Townsend, Rajat Das Gupta, Arpita Ghosh, Lal B. Rawal, Kjersti Mørkrid, Abdullah Mamun. "Clustering of metabolic and behavioural risk factors for cardiovascular diseases among the adult population in South and Southeast Asia: findings from WHO STEPS data", The Lancet Regional Health - Southeast Asia, 2023

1%

6	www.medrxiv.org Internet Source	1 %
7	"South-East Asia Eye Health", Springer Science and Business Media LLC, 2021 Publication	1 %
8	orcid.org Internet Source	1 %
9	Submitted to Intercollege Student Paper	1 %
10	dhhs.ne.gov Internet Source	1 %
11	www.mdpi.com Internet Source	1 %
12	Gulam Muhammed Al Kibria, Krystal Swasey, Md. Zabir Hasan, Allysha Choudhury et al. "Determinants of hypertension among adults in Bangladesh as per the JNC7 and 2017 ACC/AHA hypertension guidelines", Journal of the American Society of Hypertension, 2018 Publication	1 %
13	www.jmir.org Internet Source	1 %
14	Krishna Kumar Aryal, Suresh Mehata, Sushhama Neupane, Abhinav Vaidya et al. "The Burden and Determinants of Non	1 %

Communicable Diseases Risk Factors in Nepal: Findings from a Nationwide STEPS Survey", PLOS ONE, 2015

Publication

15	apps.who.int Internet Source	1 %
----	--	-----

16	tampub.uta.fi Internet Source	1 %
----	--	-----

17	www.globalhealthaction.net Internet Source	1 %
----	--	-----

18	www.phac-aspc.gc.ca Internet Source	1 %
----	--	-----

19	Mohammad Delwar Hossain, Md Abdul Qyuum, Abu Shoyeb Md Mahamuduzzaman, Imam Uddin Md. Abu Kawsar Mir et al. "Risk Factors of Birth Defects: A Case-control Study in a Tertiary Level Hospital", Bangabandhu Sheikh Mujib Medical College Journal, 2023 Publication	1 %
----	---	-----

20	bora.uib.no Internet Source	1 %
----	--	-----

21	dspace.ewubd.edu:8080 Internet Source	1 %
----	--	-----

22	onlinelibrary.wiley.com Internet Source	1 %
----	--	-----

www.banglajol.info

23

Internet Source

1 %

24

www.scribd.com

Internet Source

1 %

25

Parthibane Sivanantham, Jaya Prakash Sahoo, Subitha Lakshminarayanan, Zachariah Bobby, Jeyanthi Anandraj, Sitanshu Sekhar Kar.

"Prevalence of clustering of non-communicable disease risk factors in a highly urbanized district of India: findings of a cross-sectional survey in Puducherry", Journal of Diabetes & Metabolic Disorders, 2023

Publication

<1 %

26

bmcpublichealth.biomedcentral.com

Internet Source

<1 %

27

globalagewatch.org

Internet Source

<1 %

28

www.thelancet.com

Internet Source

<1 %

29

Bihungum Bista, Meghnath Dhimal, Saroj Bhattarai, Tamanna Neupane et al.

"Prevalence of non-communicable diseases risk factors and their determinants: Results from STEPS survey 2019, Nepal", PLOS ONE, 2021

Publication

<1 %

Exclude quotes On

Exclude matches Off

Exclude bibliography On

NCDs2

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7