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Assessment of non-communicable diseases risk factors knowledge, and prevention practices among non-physician healthcare workers in selected primary and secondary hospitals of northern Bangladesh: a facility-based cross-sectional study

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Abstract

Background: Non-communicable diseases (NCDs) pose a growing challenge for health systems in low- and middle-income countries (LMICs), where non-physician healthcare workers (NP-HCWs) constitute a substantial proportion of the frontline workforce engaged in prevention and health promotion. However, evidence on NP-HCWs' knowledge of NCD risk factors and preventive practices in Bangladesh remains limited. Methods: This facility based cross sectional study assessed NCD related knowledge and preventive practices among NP-HCWs, including nurses, community health care providers, health assistants, and support staff, across two secondary and six primary level government healthcare facilities in Nilphamari district, northern Bangladesh, between August 2023 and January 2024. Data were collected using a structured, pretested questionnaire informed by a modified WHO STEPS approach and analysed using descriptive statistics and multivariable logistic regression. Results: Most NP-HCWs were female (59%) with a mean age of 37.1± 9.7 years. Overall, 70% of NP-HCWs demonstrated good knowledge (≥80%), though gaps existed. Over 45% did not recognize NCDs as non-infectious, and 33% of nurses believed they were not preventable. However, only 13% of NP-HCWs practiced stress management, and 27% underwent regular health check-ups. Graduates and those with higher educational degrees were a significant predictor of good preventive practice (aOR: 4.9; 95% CI: 1.13–21.33; p = 0.03). Support staff consistently showed lower odds for both good knowledge and practices in unadjusted analyses. Conclusion: These findings show that while NP HCWs generally have good knowledge of NCDs, preventive practices remain limited. Targeted, cadre specific interventions are needed to improve NCD related knowledge and preventive behaviours among NP HCWs.

Background

Non-communicable diseases (NCDs) represent a growing crisis of global health and sustainable development. NCDs are responsible for 42 million deaths each year, equivalent to 73.4% of all fatalities(1). With the rising burden, NCDs have become the leading cause of mortality worldwide(2, 3). NCDs are diseases that are not transmissible from one person to another, such as hypertension, diabetes mellitus, cardiovascular diseases (CVDs), cancers, and chronic respiratory diseases (CRDs), with the latter four accounting for over 80% of all premature NCD deaths(3–5). In Low and middle-income countries (LMICs), the persistent burden of NCDs has demonstrably impeded economic growth, development, and overall progress(6–9). It is anticipated that NCDs will be responsible for half of the global disease burden in emerging nations(10). Urbanization, aging populations, lifestyle changes, and rising processed food consumption in LMICs have shifted disease patterns, increasing the NCD burden driven by poor diets, inactivity, obesity, smoking, and alcohol use (5, 11–18).

Bangladesh is undergoing an epidemiological shift toward a double burden of both communicable and non-communicable diseases(19–21). The World Health Organization (WHO) estimates a global shortfall of 18 million health workers by 2030 as a result of the escalating NCD burden, underscoring the necessity of involving non-physician healthcare workers (NP-HCWs) in delivering essential NCD-related care. It is therefore imperative that these providers possess sufficient knowledge of NCD risk factors and demonstrate effective preventive practices to support the promotion of healthy behaviors. Between 1990 and 2019, NCD cases in Bangladesh rose from 95.5 to 145 million, while Communicable, Maternal, Neonatal, and Nutritional (CMNN) diseases declined from 104.9 to 88.6 million, with NCDs accounting for 14 of the top 20 causes of death in 2019(20).

Non-physician healthcare workers (NP-HCWs)—including nurses, Community Health Care Providers (CHCP), Health Assistants (HA), lab technologists, and support staff —are essential to healthcare services(22). Task sharing has been promoted to address the rising burden of NCDs by involving NP-HCWs in prevention and management efforts(23). Their close community engagement positions them to support self-management(24). However, despite the nature of their work being health promotion and disease prevention, HCWs exhibit a gradual trend toward NCD and have higher NCD levels than those of the general population (25). As Bangladesh pursues its Sustainable Development Goals (SDGs), addressing NCDs is crucial, with success depending on healthcare workers' knowledge of risk factors and adoption of preventive practices to promote healthy behavior(24, 26). Given the health system's struggle with the long-term demands of NCD care, properly training NP-HCWs is essential to improve outcomes (27, 28).

To the best of our knowledge, no study in Bangladesh has comprehensively assessed NP-HCWs' knowledge of NCD risk factors and preventive practices. Existing research has either focused on specific subgroups of NP-HCWs or on other population groups. Therefore, this study aimed to assess knowledge of NCD risk factors and preventive practices among NP-HCWs in Nilphamari district of northern Bangladesh, providing district-level evidence with indicative insights for the wider region. The findings are intended to identify potential areas for intervention and improvement to strengthen NP-HCWs' capacity in addressing the growing NCD burden, both for the populations they serve and for their own well-being.

Materials and Methods

Study Design and Setting

This facility-based cross-sectional study was conducted from August 1, 2023, to January 30, 2024, in Nilphamari district, northern Bangladesh. To enhance representativeness, Nilphamari was randomly selected from among the northern districts, ensuring that each had an equal chance of inclusion.

All government secondary- and primary-level healthcare facilities within the district were included, comprising the Nilphamari 250-bed District Hospital, Saidpur 100-bed Hospital, Upazila Health Complexes (Supplemental Fig. 1).

Study population and sampling

The study population consisted of all non-physician healthcare workers (NP-HCWs) directly engaged in patient care at the selected facilities during the study period. NP-HCWs working in basic science departments or those not involved in patient care were excluded.

Participants were categorized into three groups: nurses, community health care providers (CHCP) / health assistants (HA), and support staff. CHCP, primarily based in community clinics, deliver primary healthcare, family planning, nutrition, and non-communicable disease services to rural populations. HAs provide domiciliary services at the ward or village level and were grouped with CHCP/HA due to the similarity of their roles (29).

A total of 301 NP-HCWs—comprising nurses, CHCP, HA, and support staff—provided verbal consent and were enrolled. This strategy achieved near-complete coverage of the target population within Nilphamari, thereby strengthening the validity of the findings at the district level, while also providing insights that may also provide indicative of broader patterns across northern Bangladesh.

Data Collection Instrument

Data were collected using a structured interviewer-administered questionnaire developed from the WHO STEP-wise approach to NCD risk factor surveillance and refined with expert input (30).

The questionnaire included four sections: (1) eligibility criteria; (2) sociodemographic characteristics, anthropometry, and history of selected NCDs; (3) knowledge of NCD risk factors; and (4) preventive practices. Knowledge was scored with one point per correct response and zero for incorrect or "don't know" answers. Scores were categorized as poor (< 80%) or good (≥ 80%). Preventive practices were scored based on the number of recommended behaviors adopted: poor (0–2 practices) and good (3–6 practices).

Study procedure

The data collection was conducted in three steps. In the first step, eligible NP-HCWs were interviewed face-to-face at their respective healthcare facilities. Interviewers explained the study objectives, obtained verbal consent, and conducted interviews in private settings to maintain confidentiality and encourage accurate responses. In the second step, physical measurements—including blood pressure, fasting capillary blood glucose, and anthropometry—were taken following standard protocols outlined in the "Non-communicable Disease Risk Factors Survey Bangladesh 201"(31). For blood pressure measurement, participants were asked to sit and relax for five minutes before the reading. Two blood pressure measurements were taken on the right arm using an aneroid sphygmomanometer and a 3M™ Littmann Classic II stethoscope, with diastolic pressure determined using Korotkoff Phase V. A two-minute interval was maintained between measurements, and the average of the two readings was used. Pulse rate was recorded with each reading. Participants were classified as hypertensive if they had a systolic blood pressure of ≥ 140 mmHg, a diastolic blood pressure of ≥ 90 mmHg, or a known history of hypertension(32).

Anthropometric data included height and weight. Height was measured to the nearest millimeter using a portable stadiometer, with participants standing barefoot, feet together, and facing forward. Weight was recorded using a portable digital scale, with participants wearing light clothing and no shoes. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Furthermore, BMI was categorized following the WHO and National Institutes of Health guidelines for the general population: underweight (< 18.5), normal weight (18.5–<25.0), overweight (25.0–<30.0), and obese (≥ 30.0) (33).

In the third step, fasting capillary blood glucose was measured using an Accu-Chek® Instant glucometer after confirming that participants had fasted for at least eight hours. All procedures were conducted using aseptic techniques. Participants with fasting blood glucose levels ≥ 7.0 mmol/L or those on antidiabetic medication were classified as diabetic(34).

Data Analysis

Data quality was ensured through completeness checks, validation, and cleaning. Data from hard copies were entered into Microsoft Excel and subsequently imported into R software (version 4.4.2) with the tidy verse and MASS packages for analysis. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to analyze demographic variables. Multivariable logistic regression was done, and chi-square tests and Pearson's correlation tests were used to assess associations between dependent and independent variables, with a p-value < 0.05 considered statistically significant. Results were presented using frequency tables, graphs, maps.

Ethical Considerations

Ethical approval was obtained from the Ethical Review Committee of the State University of Bangladesh, and permission was secured from the Civil Surgeon of Nilphamari District Hospital. Verbal consent was obtained from all respondents before data collection, and privacy and confidentiality were strictly maintained. Proper aseptic measures were maintained during blood collection through instant glucometer. Participants had the right to withdraw from the study at any time without providing a reason. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Results

Sociodemographic and health-related characteristics:

We interviewed 301 NP-HCWs, most of them were female 179(59%). Mean age of the participants was 37.1 ± 9.7 years, and the largest age group was 30–44 years, comprising 125 (42%) NP-HCWs. Nurses 135 (45%) constituted the largest professional group, followed by CHCP/HA 108 (36%), and support staff58 (19%). Nearly half of the respondents earned between 25,000–50,000 BDT (≈ 410 USD), and the majority had completed graduation or above educational level. Among the NP-HCWs, 88 (29%) reported having at least one NCDs (Table 1).

Table 1
Sociodemographic characteristics of NP-HCWs in Nilphamari district, northern Bangladesh (August 1, 2023 – January 30, 2024; N = 301)

Characteristics	Frequency n (%)
Gender	
Male	122 (41%)
Female	179 (59%)
Age (years)	
< 30	64 (21%)
30–44	125 (42%)
≥ 45	112 (37%)
Mean ± SD	37.1 ± 9.7
Marital Status	
Single	15 (5%)
Married	285 (95%)
Divorced/Widowed	1 (0%)
Religion	
Muslim	245 (81%)
Hindu	53 (18%)
Christian	3 (1%)
Body mass index (BMI)	
Underweight	11 (3.7%)
Normal	91 (30.2%)
Overweight	121 (40.2%)
Obese	73 (24.3%)
Professional Category	
Nurse	135 (45%)
CHCP/HA	108 (36%)
Support Staff	58 (19%)
Income Category	
Under 25,000 BDT	63 (21%)
25,000–50,000 BDT	142 (47%)
Above 50,000 BDT	92 (31%)
Education Category	
Up-to Primary	13 (4%)
Completed Secondary	14 (5%)
Completed graduation and Above	273 (91%)
Non-Communicable Disease	
Absent	213 (71%)
Present	88 (29%)

Knowledge of NCDs:

Overall, 70% (212) NP-HCWs had good knowledge (score ≥ 80%). Most showed good knowledge of well-known NCD risk factors like tobacco use, inactivity, and alcohol. However, over 45% lacked understanding regarding infection-related NCD risks, and 67% of nurses, 96% of CHCP/HA, and 84% of support staff correctly responded that NCDs cannot be prevented (Table 2).

Table 2
Knowledge scores on non-communicable diseases among NP-HCWs in Nilphamari district, northern Bangladesh (August 1, 2023 – January 30, 2024; N = 301)

NCD risk factors	Correct responses n (%)			
	Nurse (n = 135)	CHCP/HA (n = 108)	Support staff (n = 58)	Total (N = 301)
NCDs are not transmissible	122 (90)	99 (92)	28 (48)	249 (83)
Tobacco use as a risk factor	129 (96)	107 (99)	53 (91)	289 (96)
Physical inactivity as a risk factor	125 (93)	107 (99)	52 (90)	284 (94)
Fruits & vegetables lower the risk	109 (81)	103 (95)	49 (84)	261 (87)
Alcohol increases the risk	130 (96)	107 (99)	57 (98)	294 (98)
Obesity as a risk factor	126 (93)	105 (97)	48 (83)	279 (93)
High BP as a risk factor	130 (96)	106 (98)	53 (91)	289 (96)
Anxiety & stress impact NCDs	125 (93)	103 (95)	48 (83)	276 (92)
The belief that NCDs are primarily caused by infections	77 (57)	64 (59)	26 (45)	167 (55)
Belief that NCDs cannot be prevented	91 (67)	104 (96)	49 (84)	244 (81)
Air pollution increases NCDs risk	122 (90)	94 (87)	48 (83)	264 (88)
High sugary drink consumption	124 (92)	107 (99)	54 (93)	285 (95)
Family history/genetics as a risk factor	128 (95)	108 (100)	50 (86)	286 (95)
Age as a risk factor	126 (93)	105 (97)	49 (84)	280 (93)
Overall Knowledge Score				
Good knowledge (≥ 80%)	100 (74)	86 (80)	26 (45)	212 (70)
Poor knowledge (< 80%)	35 (26)	22 (20)	32 (55)	89 (30)

Preventive practice:

NP-HCWs most commonly reported preventive practices were maintaining a balanced diet 230 (76%) and engaging in physical activity 143 (48%). However, only 39 (13%) practiced stress management, and 80 (27%) underwent regular health check-ups. Nurses showed greater adherence to healthy behaviors than CHCP/HA and support staff, particularly in physical activity, check-ups, and weight control (Fig. 1). Overall, 118 (41%) participants reported poor preventive practices (engaging in 0–2 practice), with the highest among support staff, 29 (50%) (Supplementary table 1).

Predictors of NCD knowledge:

NP-HCWs with graduation and above education level showed better knowledge of NCD risk factors (aOR: 2.89; 95% CI: 0.66–12.68; p = 0.16), though not statistically significant. Support staff had significantly lower odds in unadjusted analysis (uOR: 0.28; 95% CI: 0.15–0.53; p < 0.01), but this association attenuated after adjustment (aOR: 0.44; 95% CI: 0.16–1.22; p = 0.11). Other demographic or health factors were not significantly associated (Table 3).

Table 3
Predictors associated with knowledge level on non-communicable diseases among NP-HCWs in Nilphamari district, northern Bangladesh (August 1, 2023 – January 30, 2024; N = 301)

Variable	uOR (95% CI)	p-value	aOR (95% CI)	p-value
Age in years				
< 30	Reference		Reference	
30–44	1.19 (0.68–2.11)	0.55	1.11 (0.54–2.27)	0.77
≥ 45	1.14 (0.56–2.31)	0.71	0.83 (0.32–2.14)	0.7
Sex				
Female	1.68 (1.01–2.8)	0.04	1.4 (0.67–2.92)	0.37
Male	Reference		Reference	
Education				
Up to primary	Reference		Reference	
Completed Secondary	5.12 (1.43–18.25)	**0.01**	2.89 (0.71–11.82)	0.14
Completed graduation and above	7.08 (2.15–23.47)	**< 0.01**	2.89 (0.66–12.68)	0.16
Occupational-level				
Nurse	Reference		Reference	
CHCP/HA	1.37 (0.73–2.5)	0.31	1.68 (0.73–3.86)	0.22
Support Staff	0.28 (0.15–0.53)	**< 0.01**	0.44 (0.16–1.22)	0.11
BMI				
Underweight	0.66 (0.18–2.35)	0.52	1.51 (0.34–6.69)	0.59
Normal	Reference		Reference	
Overweight	0.85 (0.5–1.45)	0.56	0.76 (0.42–1.38)	0.36
Obese	0.59 (0.22–1.6)	0.31	0.59 (0.19–1.8)	0.35
Marital Status				
Married	1.68 (1.01–2.8)	0.15	1.77 (0.54–5.75)	0.34
Single	Reference		Reference	
Non-Communicable Disease				
Absent	0.73 (0.41–1.28)	0.27	0.54 (0.27–1.09)	0.09
Present	Reference		Reference	
Level of preventive practice				
Good practice (3–6 practices)	1.08 (0.64–1.79)	0.77	0.9 (0.52–1.57)	0.72
Poor practice (1–2 practices)	Reference		Reference	
Bold values indicated that the findings are significant.				
‡χ2 test was run between risk factors, statistical significance p < 0.05, and presented as bold values.				
NP-HCWs, Non-physician Healthcare workers; OR, Odds ratio; NCD, Non-Communicable Disease; BMI, Body Mass Index.				

Predictors of preventive practices: NP-HCWs with a graduation and above degree had a significant association with good preventive practice (aOR: 4.9; 95% CI: 1.13–21.33; p = 0.03). Support staff had lower odds in unadjusted analysis (uOR: 0.52; 95% CI: 0.27–0.99; p = 0.04), but this association was not significant after adjustment (aOR: 0.7; 95% CI: 0.26–1.86; p = 0.48) (Table 4).

Table 4
Predictors associated with preventive practices for NCDs among NP-HCWs in Nilphamari district, northern, Bangladesh (August 1, 2023 – January 30, 2024; N = 301)

Variable	uOR (95% CI)	p-value	aOR (95% CI)	p-value
Age in years				
< 30	Reference		Reference	
30–44	0.79 (0.46–1.38)	0.41	0.93 (0.48–1.8)	0.83
≥ 45	0.89 (0.45–1.78)	0.74	1.36 (0.56–3.29)	0.5
Sex				
Female	1.27 (7.09–2.03)	0.32	1.01 (0.53–1.92)	0.99
Male	Reference		Reference	
Education				
Up to primary	Reference		Reference	
Completed Secondary	3.37 (0.95–11.76)	0.06	3.86 (0.96–15.49)	0.06
Completed graduation and above	4.39 (1.33–14.52)	**0.01**	4.9 (1.13–21.33)	**0.03**
Occupational-level				
Nurse	Reference		Reference	
CHCP/HA	0.78 (0.46–1.32)	0.36	0.78 (0.38–1.6)	0.49
Support Staff	0.52 (0.27–0.99)	**0.04**	0.7 (0.26–1.86)	0.48
BMI				
Underweight	0.97 (0.27–3.47)	0.97	1.36 (0.33–5.58)	0.67
Normal	Reference		Reference	
Overweight	0.68 (0.42–1.12)	0.12	0.75 (0.44–1.27)	0.28
Obese	1.11 (0.4–3.15)	0.84	1.33 (0.44–4.01)	0.61
Marital Status				
Married	1.38 (0.49–3.89)	0.55	1.7 (0.54–5.42)	0.37
Single	Reference		Reference	
Non-Communicable Disease				
Absent	1.18 (0.71–1.97)	0.52	1.09 (0.6–1.97)	0.78
Present	Reference		Reference	
Knowledge				
Good knowledge (≥ 80% correct)	1.08 (0.64–1.79)	0.77	0.86 (0.5–1.49)	0.59
Poor knowledge (< 80% correct)	Reference			

Bold values indicated that the findings were significant.

‡χ2 test was run between risk factors, statistical significance p < 0.05, and presented as bold values.

NP-HCWs, Non-physician Healthcare workers; OR, Odds ratio; NCD, Non-Communicable Disease; BMI, Body Mass Index.

Discussion

This study found that NP-HCWs in northern Bangladesh generally possessed good knowledge of NCD risk factors, particularly tobacco use, physical inactivity, and alcohol consumption, findings that are consistent with previous research in low- and middle-income countries (LMICs) (5, 12, 35–37). However, notable misconceptions persisted—nearly half of the participants believed NCDs are caused by infections, and about one-fifth thought they are not preventable. These misconceptions reflect incomplete understanding of NCD etiology and prevention, similar to patterns reported in other LMICs where awareness of NCD preventability remains limited (28, 35). Differences in knowledge levels may be influenced by sociodemographic factors, professional roles, work experience, and exposure to NCD-specific training. Addressing these disparities through focused capacity-building initiatives is essential to foster a comprehensive understanding of NCDs among NP-HCWs and improve community-level prevention efforts.

In terms of preventive practices, 48–76% of NP-HCWs reported engaging in physical activity and maintaining a balanced diet. Similar activity levels among healthcare professionals have been reported (38). However, a study reported from Bangladesh among healthcare workers showed only 13.1% physically

active and 43.7% maintaining a balanced diet (39). These contrast findings may be due to occupational differences, healthcare settings, or sample characteristics. To enhance such practices, targeted education and awareness of their long-term health benefits are critical (40). Only 13% and 27% of participants reported practicing stress management and undergoing regular health check-ups, respectively. These results mirror previous findings showing low participation in such practices (41). Time constraints, heavy workloads, and a perceived sense of good health likely contribute to these low rates (42). This highlights a critical gap in the adoption of preventive strategies necessary to reduce NCD risk.

Over two-fifths of NP-HCWs, particularly support staff, demonstrated poor engagement in preventive practices. This trend has also been reported elsewhere, where lower-level healthcare workers face barriers such as limited resources, time, and institutional support (13). There is a clear need for policies and interventions that support the adoption of comprehensive health practices, especially in low-resource settings, to ensure NP-HCWs can effectively serve as role models for the community.

NP-HCWs with a graduate-level education or higher emerged as significant predictors of both knowledge and preventive practices regarding NCDs, consistent with literature linking education to health literacy and healthy behavior (28, 35). Furthermore, the level of occupation is also associated with better knowledge and preventive practices of NP-HCWs, and prior research found similar findings (28, 35, 38). This may relate to differences in training exposure or involvement in NCD-related activities. In this study, we did not find a significant association between knowledge and preventive practice and factors such as age, sex, BMI, marital status, and history of NCDs. Although some studies have found such associations (43–45), our differing results may stem from sample size, contextual variation, or population characteristics.

This study highlights the need for targeted interventions to enhance NP-HCWs' knowledge and practices related to NCDs, emphasizing accurate, up-to-date information and promoting healthy behaviors. Educational programs on NCD prevention and management should address misconceptions and include stress management and regular health check-ups. Additionally, strengthening the capacities of lower-tier NP-HCWs, such as CHCP/HA and support staff, through training and supportive policies is essential to improving their engagement in preventive care. These findings can inform Bangladesh's national NCD control strategy and WHO PEN implementation framework.

Strengths and limitations of this study

This is the first study in Bangladesh to comprehensively assess knowledge of NCD risk factors and preventive practices among NP-HCWs. The random selection of Nilphamari district and inclusion of nearly all eligible NP-HCWs ensured strong district level representativeness, although the single district design limits generalizability and provides only indicative insights for northern Bangladesh. The inclusion of multiple cadres of NP HCWs and use of a modified WHO STEPS based tool, incorporating objective measures such as blood pressure, body mass index, and fasting glucose, strengthened the reliability of the findings. However, reliance on self-reported information and glucometer-based diabetes measurements may have introduced bias, although similar methodological approaches and findings have been reported in other LMICs settings.

Conclusion

This study provides valuable insights into the knowledge and practices regarding NCDs among NP-HCWs in Nilphamari district, northern Bangladesh. While the overall knowledge related to NCDs was relatively good, there are notable gaps, particularly in the understanding of NCDs preventability and the role of infections and the adoption of certain preventive behaviors, particularly stress management and health check-ups, and two-fifths of them reported 0–2 preventive practices. Education and designation or position in the occupation were found to be significant predictors of both knowledge and preventive practices. Addressing these gaps through targeted educational programs and interventions could improve NP-HCWs knowledge and preventive behaviors of NCDs, ultimately benefiting both the NP-HCWs and the communities they serve.

Abbreviations

NP
HCWs-Non-physician Health Care Workers
LMICs
Low-and middle-income countries
NCDs
Non-communicable diseases
CVDs
Cardiovascular diseases
BMI
Body Mass Index

Declarations

Ethics approval and consent to participate: Ethical approval was granted by the Ethical Review Committee of the State University of Bangladesh, and permission was obtained from the Civil Surgeon of Nilphamari District Hospital. Verbal consent was provided by all participants, with privacy and confidentiality maintained throughout. Participants were free to withdraw from the study at any time without explanation. The study adhered to the ethical principles of the Declaration of Helsinki.

Consent for publication: Not applicable.

Availability of data and materials: All relevant data are provided in the manuscript. Dataset access can be requested from the corresponding author through the State University of Bangladesh's research administration, in line with institutional policy.

Competing interests: The authors declare that they have no competing interests relevant to this study.

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Authors' contributions:

MAH conceived and designed the study, coordinated data collection, performed the analyses, and drafted the manuscript. AKB and MT contributed to study design, data collection, analysis, and manuscript review. MSS provided methodological input, assisted with data interpretation, and critically revised the manuscript. MRK, SH, and MTR contributed to data collection, management, and preparation of tables/figures. IH supported supervision, ensured data quality, and reviewed the manuscript. SN supervised the overall study and critically revised the manuscript.

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Patient and public involvement:

Patients or members of the public were not involved in the design, conduct, reporting, or dissemination plans of this research.

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46. Generative AI-statement. Grammarly was used to support language editing, grammar, and clarity. The authors reviewed and approved all changes and take full responsibility for the content of the manuscript. AI was not used for data analysis, interpretation, or generation of scientific content.

Figures

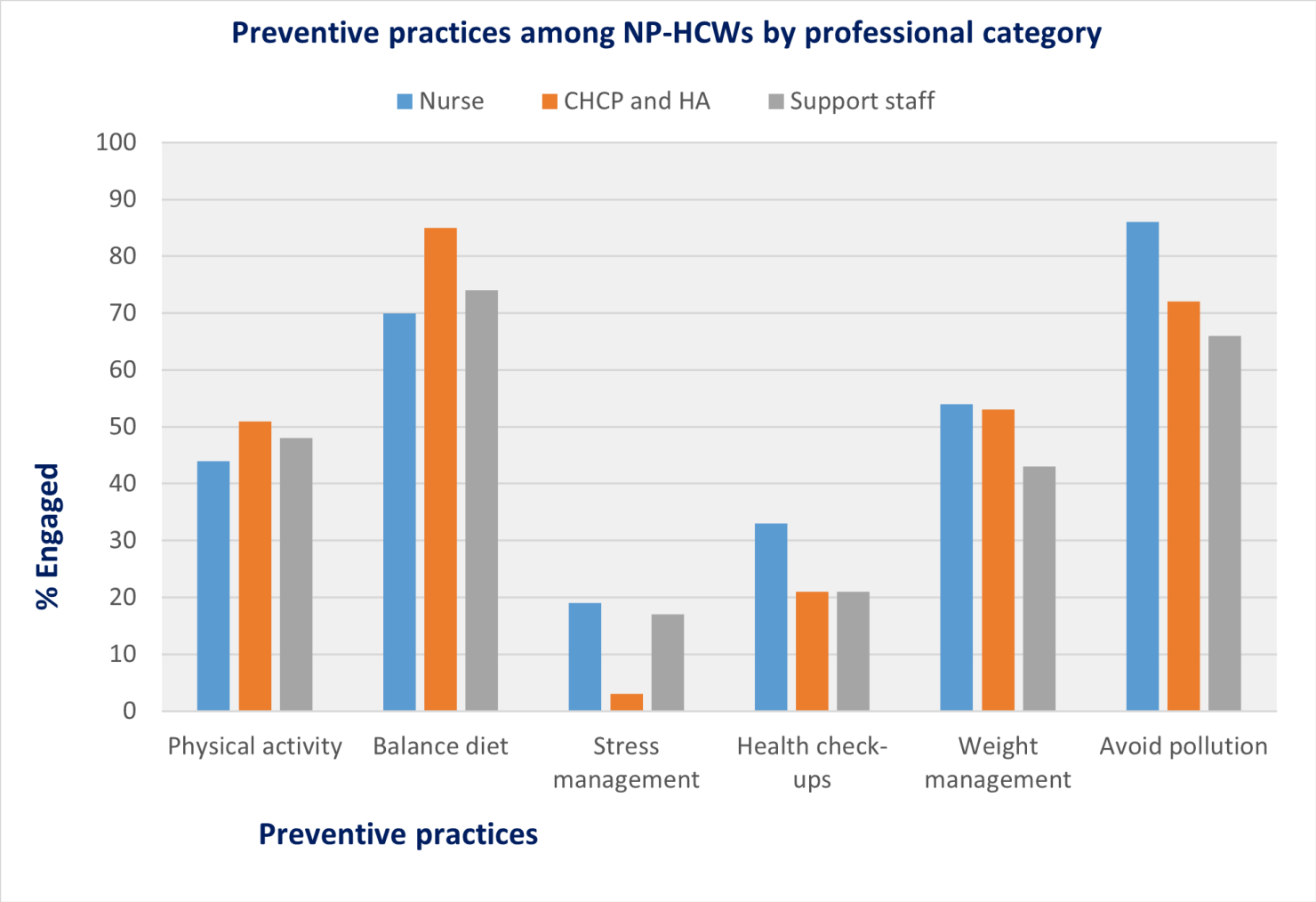


Figure 1

Practices for managing Non-communicable disease risk factors among NP-HCWs in Nilphamari district, northern Bangladesh.